THE POWER OF PLACE-BASED SCIENCE: USING PLACE-BASED SCIENCE CURRICULUM TO FOSTER ACADEMIC VOCABULARY IN PRESCHOOL AGED STUDENTS

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Miya K. Nishio

Thesis Committee:

Leah Muccio, Chairperson
Pauline Chinn
Lori Fulton

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Abstract

With an increased focus on school readiness resulting from the passage of the "Race to the Top Act" and the "Every Student Succeeds Act," professionals in the field of early childhood education have experienced a shift toward standardization. These shifts have yielded increased pressure on experts and practitioners in the field of early childhood education to define high quality experiences for young children to ensure they develop the required academic skills as they enter kindergarten. This study explored issues of quality in preschool learning experiences using a theoretical framework of sociocultural theory. This study used a case study approach to examine how place-based science curricula can create meaningful learning experiences that foster the development of academic vocabulary in preschool aged children. It was found that place-based science fostered the development of academic skills and additionally increased student engagement and socio-emotional competencies.

Table of Contents

List of Figures

List of Tables

Chapter 1. Introduction

Problem and Significance

The foundation of a child's success in school and later in life is built during the early years of development (Shonkoff & Phillips, 2000). This was supported by scientific advancements in technology that enabled research, proving that early experiences power the strengthening and pruning of neuronal systems in the brain (Shonkoff & Phillips, 2000). The recognition of the profound effects early childhood education has on the success of children throughout their lifetime, has prompted the creation of legislation that focuses on the academic achievement of young children (Shonkoff & Phillips, 2000).

According to the U.S. Department of Education, recent legislation has focused efforts on supporting American children through the passage of the, Race to the Top Act of 2009 and the Every Student Succeeds Act of 2015. The most current law, ESSA is a reauthorization of the 1965, Elementary and Secondary Education Act (ESEA) signed by President Johnson. ESEA addressed the educational inequalities that existed in America which resulted in the marginalization of the country's most vulnerable children. This legislation has resulted in great changes in the field of early childhood education and has increased pressure for preschool aged children to demonstrate school readiness; a set of pre-academic skills students should know before entering kindergarten (Feeney & Grace, 2005).

Prior to this legislation, the field of early childhood education was guided by recommended practices (Kagan, Britto, & Engle, 2005). However, with the increased focus on preschool aged children to demonstrate school-readiness, there has been a shift towards specific skills and knowledge children should have as they leave early learning programs (Kagan et al., 2005). These specific skills and knowledge children should know are defined in early learning standards, "documents that articulate expectations for children's learning and development prior to kindergarten entry" (Scott-Little, Kagan, & Frelow, 2006, p. 153). Standardization, through the development of early learning standards, is new for the field of early childhood education and has called for renewed attention to curriculum (Feeney & Moravcik, 2005).

Curriculum that best supports children's development allows children to learn through authentic experiences. These experiences allow a child's brain to be surrounded by authentic, real-life, hands-on, meaningful learning experiences, that are culturally relevant, promote

cooperation and interaction, and bridge together multiple disciplines (Rushton, 2011; Zemelman, Daniels, Hyde, & Varner, 1998). Bridging together multiple disciplines while maintaining academic rigor can be achieved through integrated studies (Zhbanova, Rule, Montgomery, & Nielsen, 2010). Integrated studies is an approach to learning that combines multiple subjects and provides children with opportunities to participate and interact with concepts through multiple lenses, and may offer a framework for learning that can support the authentic development of academic knowledge through high quality experiences (Aerila & Rönkkö, 2013; Wraga, 2009; Zhbanova, *et al*., 2010). In hopes of enhancing the benefits an integrated study can have for young children, it is important to explore what type of content an integrated study would encompass.

Research shows vocabulary is foundational for success of students as they enter primary school (van Kleeck, 2014). The origins of literacy begin in the early years (Dickinson & McCabe, 2001). Vocabulary size at the age of three is predictive of later language and literacy achievement at the ages of 3-11 (Dickinson & McCabe, 2001). More specifically in academic settings, academic vocabulary which are words teachers use to convey knowledge to students and how students display ideas and knowledge, promotes academic success (van Kleeck, 2014). Due to their foundational importance, language and literacy are critical pieces to consider when defining curriculum quality.

With the understanding that academic vocabulary development is so important, learning how to integrate that content into authentic experiences is key. Science naturally utilizes and embeds academic vocabulary within its content. Since it is the basis of how scientific knowledge is conveyed, science curriculum may present teachers and students with the opportunities to develop academic vocabulary through meaningful and authentic experiences (Hackling & Sherriff, 2015).

There are many experiences that can be built around science. However, ensuring that the science content is authentic and meaningful may be a challenge. Connecting science exploration to the lives of children can be done through place-based learning. Place-based learning creates classroom content that is embedded within the context of student's lives, providing meaning and purpose (Smith & Sobel, 2010). Place-based learning appears to be a natural starting point for a scientific investigation to create authentic experiences for children to develop academic

vocabulary. Therefore, it is hypothesized that place-based science curriculum can foster academic vocabulary. I hope, this study can offer a new perspective of how to conceptualize the learning taking place in a preschool classroom, and encourage further exploration of how to define quality to best support all children's success.

Research Question

There is a lack of research exploring the benefits of bridging together academic vocabulary development, science, and place-based learning for preschool aged children. This study examined how place-based science curricula can create meaningful learning experiences that foster the development of academic vocabulary in preschool aged children.

Place-based science offers many opportunities to develop academic vocabulary by its ability to create authentic learning opportunities and the integration of contextualized language. This study examined how place-based science curriculum supports the development of academic vocabulary in preschool aged children through the following questions:

1. How can place-based science encourage academic vocabulary development?
2. What other kinds of outcomes, beyond academic vocabulary, may be produced from a place-based science study?
3. What are the implications for this research in defining quality of early childhood educational programs?

With the increasing focus on the early years and the shift towards standardization for the field of early childhood education, curriculum and best practices to support young children must be examined. I hope this research offers a perspective to help define high-quality for the field of early childhood education and can offer a platform to build future research endeavors.

Chapter 2. Literature Review

School Readiness and Early Childhood Education

The NAEYC (2009), position statement discusses the increasing pressure on the field of early childhood education to ensure students are prepared for success in school. Early childhood education is defined as the education of children ages 0-8 years old (NAEYC, 2009). The increased focus on academic achievement for children entering kindergarten is based on findings that show children with low school readiness often continue to struggle and experience progressively worse fates in school (Gaynor, 2015). Students entering 1st grade with low school readiness are at a higher risk of being retained than their peers who are reaching grade level academic competencies (Moser & West, 2012). Though retention has become a common practice, no positive effects have been found on a student's later achievement and in some cases students perform progressively worse (Moser & West, 2012). On the contrary children, especially children of low socioeconomic status, who attended preschool programs the year before kindergarten display higher academic achievement in math and literacy, increased social-emotional competencies, as well as have a lower risk of being retained in kindergarten (Magnuson, Meyers, Ruhm, & Waldfogel, 2004). These benefits are shown to persist through 1st grade (Magnuson *et al.*, 2004). With knowledge of the impacts school readiness has on the long term academic success of young children, educators, advocates, and policymakers have made many efforts to better define school readiness and explore its contributing factors.

One of the challenges surrounding school readiness is a lack of consensus on how to define and develop it (Feeney & Grace, 2005). School readiness is often times solely dependent on the child, creating a very narrow definition that only includes knowledge and skill (Feeney & Grace, 2005). However, school readiness is affected by a multitude of factors, including, genetics, family background, and socio-economic status (DeBaryshe, Yuen, & Ripke, 2015). Therefore, it is inappropriate to apply such a narrow definition. The following definition from Maxwell and Clifford (2004) illustrates the multifaceted nature of school readiness:

> School readiness involves more than just children. School readiness, in the broadest sense, is about children, families, early environments, schools, and communities. Children are not innately "ready" or "not ready" for school. Their skills and development

are strongly influenced by their families and through their interactions with other people and environments before coming to school. (p. 42)

This definition of school readiness brings to light the many components that contribute to a child's success in school and begs the question of how children can be best supported. Understanding the early learning standards and effective curriculum can support educators and policy makers, integrate school readiness outcomes with appropriate teaching practices to best support young children.

Early Learning Standards

The development of early learning standards has been greatly influenced by the findings from the National Science Foundation committee lead by Shonkoff & Phillips (2000), *From neurons to neighborhoods: The science of early childhood development.* This publication utilized the neuroscience of child development to begin to define high quality in early childhood educational settings. These findings prompted further research by the Center on the Developing Child (2007) that suggested high quality programs, include a highly skilled staff and small class sizes with small child-to-teacher ratios, provide language enriched environments, use developmentally appropriate curriculum, offer safe physical spaces, provide warm and responsive adults, and engage families and caregivers so that children would be motivated to attend and participate in the program.

To support these findings, federal initiatives such as, the Race to the Top Act of 2009 and the Every Student Succeeds Act of 2015 were enacted to ensure all children are provided with high quality education to prepare them for college and future careers. ESSA is a reauthorization of the Elementary and Secondary Education Act of 1965 that was created to address the educational inequalities in America, especially those that marginalized children of low socioeconomic status. ESSA is focused on providing all children with high quality education through the development of comprehensive state plans. The state plans must address closing the achievement gap by, increasing access to early childhood educational programs for all children, focusing on family and parent engagement, and coordinating with established Head Start programs and programs funded through the Child Care Development Block Grant Act to ensure quality (CEELO & CCSSO, 2015). This has opened more opportunities for federal funding and

support for the field of early childhood education but also has put pressure on the field of early childhood education to define high quality through the development of early learning standards.

The early learning standards are, "documents that articulate expectations for children's learning and development prior to kindergarten entry" (Scott-Little, Kagan, & Frelow, 2006, p. 153). These standards are used as a guide to define the knowledge, skills, and characteristics children should have as they enter their primary years and places accountability on states and communities to provide high quality education for preschool aged children (Kagan & Scott-Little, 2004; Scott-Little, Kagan, & Frelow, 2006). Findings from Kagan, Britto, & Engle (2005), state that although standards-based education for the K-12 sector of education has been around for many years, it is relatively new for early childhood education. This has resulted in a shift from recommended practices towards specific skills and knowledge children should have as they leave early learning programs (Kagan, Britto, & Engle, 2005). To ensure early learning standards are effective, they must align with what teachers teach and influence teacher certification; thus becoming the foundation for curriculum, teacher training, and accountability (Kagan, Britto, & Engle, 2005). These standards have become the foundation that guides and directs educators when choosing appropriate curriculum for their students (Feeney & Moravcik, 2005).

The State of Hawi'i Department of Education (Hawai'i DOE) created the Nā Hopena A'o, a set of six outcomes that reflect the culture and place of Hawai'i. Hawai'i is unique in its richness of indigenous language and culture. To ground education in the value of place, Nā Hopena A'o focuses on the development of the following outcomes throughout a student's journey from kindergarten to grade 12: Belonging, Responsibility, Excellence, Aloha, Total Well-being and Hawai'i (Hawai'i DOE, 2015). These outcomes were chosen to reflect and encompass culture and place as well as, recognize the importance of social and emotional learning and academic mindsets for future success (Hawai'i DOE, 2015).

The move towards standardization in the field of early childhood education has brought renewed attention on curriculum (Feeney & Moravcik, 2005). Curriculum must align requirements, set by the early learning standards, with developmentally appropriate practice. This requires a deeper understanding about the components of curriculum that make it effective for young children.

Effective Curriculum for Young Children

The National Association for the Education of Young Children (NAEYC) and the National Association of Early Childhood Specialists in State Departments of Education (NAECS/SDE, 2003) outlined a set of eight indicators of effectiveness for curriculum designed for children birth through age 8.

1. Children are active and engaged
2. Goals are clear and shared by all
3. Curriculum is evidence based
4. Valued content is learned through investigation, play, and focused on intentional teaching
5. Curriculum builds on prior learning and experiences use parallel structure
6. Curriculum is comprehensive
7. Professional standards validate the curriculum's subject-matter content
8. The curriculum is likely to benefit children

Further explanation of these indicators is provided by the joint statement made by the NAEYC and the NAECS/SDE (2003). Children must be active and engaged because children learn through active, cognitive, physical, social, and artistic activities. Child engagement with the curriculum allows a child to develop a positive attitude toward learning, develop feelings of confidence and security, and develop links between family and community. When the curricular goals are clear and shared by all, learning outcomes can be reached through consistent and coherent ways. Evidence-based curriculum should be grounded in principles of child development and learning. It is also developmentally, culturally, and linguistically relevant. When content is learned through investigation, play, and intentional teaching, children are allowed to learn about concepts important to them and connected to later learning. When content utilizes prior knowledge and experiences, it uses the strengths of the students to drive the lesson. A comprehensive curriculum focuses equally on all areas of child development, social-emotional, physical, and cognitive and must be shown to benefit children through research and other evidence. Lastly, curriculum is validated and supported by standards set by professional organizations to ensure it is of high quality and effective.

These indicators of effective curriculum can be used as the framework for practitioners to begin to create curriculum that bridges early learning standards and promotes school readiness.

To achieve the eight indicators of effective curriculum, it is important to understand how children learn.

Authentic Learning Experiences

Children's learning is supported when they are given authentic learning experiences (Van Oers & Wardekker, 1999). These experiences are created through teaching strategies that promote healthy development, by allowing a child's brain to be surrounded by authentic, real-life, hands-on, meaningful learning experiences (Rushton, 2011). These experiences are culturally relevant, promote cooperation and interaction, and bridge together multiple disciplines (Zemelman, Daniels, Hyde, & Varner, 1998). Authentic learning experiences have personal and cultural relevance and fosters a child's deep interests embedded within their natural personality traits (Van Oers & Wardekker, 1999).

> Authentic learning is a dynamic relation between personality-under-construction and cultural practices-being-reconstructed, which is aimed at developing an authentic and autonomous person able to participate in a competent yet critical way in cultural practices. (Van Oers & Wardekker, 1999, p. 231)

Unfortunately, these types of learning experiences are being pushed out of typical practices. With the rise in standardization, teacher accountability, and the focus on school readiness, the education of young children has become more reliant on scripted curriculum (Eisenbach, 2012). Scripted curriculum requires teachers to literally follow a script and adhere to mandated routines and procedures (Valli & Buese, 2007). This limits the teacher's autonomy, flexibility, and ability to encourage critical thinking and creativity (Valli & Buese, 2007). Research has shown early elementary aged children are able to decipher between scripted curriculum and authentic learning experiences (Spencer, Flachi, & Ghiso, 2011). Students are more attentive and attain more information through authentic learning when compared with scripted curriculum (Spencer *et al.*, 2011). Additionally, authentic learning experiences give more opportunities for the development of language, collaboration, and inquiry than scripted curriculum (Spencer *et al.*, 2011).

With the rising prevalence of scripted curriculum in schools, alternative approaches to learning need to be explored that can better support young children. Curricular designs that

utilize the effectiveness of authentic learning experiences may be able to help foster the development of skills defined by the early learning standards.

Integrated Study Approach

Integrated study approaches naturally allow teachers to create authentic learning experiences for their students (Zhbanova, Rule, Montgomery, & Nielsen, 2010). Integrated studies is an approach to learning that combines multiple subjects and provides children with opportunities to participate and interact with concepts through multiple lenses, providing flexibility to support diverse learners (Aerila & Rönkkö, 2013; Wraga, 2009; Zhbanova, *et al*., 2010).

There are many benefits to integrating subjects (Zhbanova *et al.*, 2010). Lessons are driven by the students; therefore, children demonstrate greater ownership and inherent motivation in their studies (Trent & Riley, 2009). Integrated approaches encourage teamwork and create a positive and motivating atmosphere where students can practice and develop collaboration skills and learn about effective communication strategies (Trent & Riley, 2009). Students demonstrate deeper understandings of the content, through the utilization of prior knowledge, and are challenged to find patterns (Zhbanova *et al.*, 2010). This pushes students to translate knowledge across disciplines; a large component of higher order thinking (Zhbanova *et al.*, 2010). Integrating subjects allows the students' inquires to become the foundation of the study, connecting the learning to their personal lives (Wraga, 2009). An integrated study focuses on concepts grounded in societal, real-world problems where students construct new knowledge and utilize prior knowledge to solve complex problems (Wraga, 2009).

Integrated studies are an effective way to support the development of academic concepts through a more holistic and authentic manner. Therefore, it is necessary to have curricular content that enables the integration of multiple disciplines cohesively and meaningfully. Since a child's learning is best supported by experiential and hands-on learning, the content of the study must also be authentic in nature allowing children to explore their world and identify and solve problems relevant to their own lives. To maximize the benefits of an integrated study, consideration of how academic knowledge is developed ensures the different content areas are integrated cohesively and meaningfully.

Vocabulary Development

To promote school readiness, high quality preschool provides children with opportunities and experiences to develop children's language and literacy (Cunningham, 2010). The language and literacy competencies of children in their preschool years are predictive of future academic success (Cunningham, 2010). Some examples of language and literacy skills are phonological awareness, print knowledge, oral language, and vocabulary (Storch & Whitehurst, 2002). More specifically within language and literacy, vocabulary and oral language use are strong indicators of later reading acquisition (Santos, 2015; Snow, Burns, & Griffin, 1998). To support preschool aged children as they enter kindergarten, early childhood educators must focus on the development of vocabulary.

High quality early childhood educational programs provide students with many opportunities to develop vocabulary through print-rich and language rich environments (Cunningham, 2010; Grace & Brandt, 2005). These environments offer students a variety of opportunities to interact with letters, books, and writing materials; giving students multiple avenues to develop language and literacy (Cunningham, 2010). They allow the learning to occur through experiences that can come in the form of book reading, learning center activities, and sociodramatic play (Grace & Brandt, 2005). This type of learning environment is enhanced through curriculum designed to present many opportunities for collaboration between teacher/student and student/student (Spencer *et al.*, 2011). Collaboration and verbal interactions are key components of a high quality environment. When students write about what they have learned they retain about 70% of the information. However, when students are given time to write and talk about what they have learned, they retain about 90% of what they have been taught (Daniels, Zemelman, & Steineke, 2007). To encourage the development of language and literacy skills, early childhood programs must provide students with opportunities to interact with a variety of materials and give time to collaborate not only with each other but also with the teacher.

Within a language-rich environment, teachers take on the role of a language facilitator by scaffolding new vocabulary in comments and questions (Santos, 2015). This type of incidental and elaborated exposure has been shown to be effective in expanding student vocabulary (Justice, Meier, & Walpole, 2005). Incidental exposure is accomplished through informal

introduction to new words such as conversation, story-telling, or television. Elaborated exposure occurs when a child is introduced to a new word from a more competent individual elaborates upon the meaning to reinforce the concept (Justice *et al.*, 2005). Incidental and elaborated exposure introduce words that naturally emerge through authentic experiences that occur naturally within an environment (Justice *et al.*, 2005; Spencer *et al.*, 2011).

Conversations have been shown to be the primary mechanism for introducing new vocabulary to students through incidental exposure (Harris, Golinkoff, & Hirsch-Pasek, 2011). High quality conversations between teachers and students create opportunities to scaffold knowledge of words by encouraging children to utilize new vocabulary through questioning and reciprocation (Dickinson & McCabe, 2001). These high quality conversations between students and teachers include discussion, questioning, and feedback that support and encourage students to continue to participate in their literacy development (Snow, 1983).

High quality early childhood educational programs go beyond just providing children with materials. They provide children with a variety of opportunities to develop vocabulary through their environments, which encompass children's experiences and interactions. By providing children with environments and many avenues to learn, programs are able to support and foster the knowledge for a diversity of learners to succeed. To fulfill the early learning standards, knowledge of subject content that can be integrated to support effective and appropriate learning environments, offers valuable insight of how to support young children.

Academic Vocabulary

Academic vocabulary is a foundational set of words upon which language can build and promote later academic success (van Kleeck, 2014). They are specific words used within academic settings that teachers use to communicate concepts to students, and students use to share ideas and knowledge with teachers (van Kleeck, 2014). Academic language is acquired by being, "immersed in rich activities in which academic language is modeled and used in purposeful and meaningful ways" (Gee, 2008, p. 68).

The development of academic vocabulary can be grouped into three tiers identified by Beck, McKeown, and Kucan (2002), see Table 1. The first tier of vocabulary development is the utilization of everyday words. These kinds of words are used at high frequencies and are almost universal. The second tier of language is described as words that are used by more literate

individuals. The third, and most advanced tier of vocabulary development consists of words that are low frequency and are specific to a professional field (Snow, 2008).

Science naturally integrates language because, "language is critical in the mediation of scientific reasoning, higher-order thinking and the development of scientific literacy" (Hackling & Sherriff, 2015, p. 14). Tier 2 language has been identified by researchers as the most important tier of language for understanding scientific discourse because these are words that are commonly used in the field of science, yet many children do not know them prior to entering school (Snow, 2008). Compared to other content areas, science textbooks utilize Tier 2 and Tier 3 language at a higher rate (DeLuca, 2010). Therefore, science is a natural foundation to develop academic vocabulary. There is research on the positive outcomes of using science as a foundation to build academic vocabulary in early elementary and kindergarten settings (Snow, 2008). However, there is no research on the advantages of using science curriculum to develop academic vocabulary in preschool settings.

Table 1

Examples of the Tiers of Vocabulary (DeLuca, 2010)

Tier 1	Tier 2	Tier 3
Eat	Consume	Masticate
Skin	Hide	Epidermis
Meat-Eater	Consumer	Carnivore

Science Curriculum

Science is an inquiry-based subject presenting students with many authentic learning opportunities. It was found in early childhood educational settings, science-based curriculum successfully integrates traditional content standards, while maintaining developmentally appropriate practices (Gerde, Schachter, & Wasik, 2013). Science allows educators to focus on a multitude of developmental domains by integrating critical language, literacy, and math readiness skills (Gerde et al., 2013). Science provides real-life and authentic learning

experiences that scaffold vocabulary development by encouraging students to observe, question, and investigate answers (Gerde, et al., 2013; Huerta & Jackson, 2010).

Science-based studies give children the agency to follow their curiosity through a basic pattern of exploration: asking a question, making a hypothesis, conducting an experiment, making and recording observations, and coming up with a conclusion (Joyner, Majerich, & Goel, 2013). These steps naturally encourage the scaffolding of knowledge and allow children to build off of prior observations (Joyner et al., 2013). It allows children to ask questions about where they live and participate in finding the answers (Gerde *et al.*, 2013). Scientific reasoning requires fluency in language and literacy, and promotes the development of higher levels of critical thinking (Hackling & Sherriff, 2015). During science studies children exhibit higher rates of intrinsic motivation to learn new vocabulary and many teachers have utilized science as a catalyst to encourage language development (Hackling & Sherriff, 2015; Lott & Read, 2012). Science allows early childhood educators to successfully utilize the natural ways in which children learn, while continuing to foster competencies that meet the early learning standards (Baldwin, Adams, & Kelly, 2009).

To support science learning, the Next Generation Science Standards (NGSS) were created (NGSS Lead States, 2013). These standards were developed by twenty-six state Lead State Partners and other stakeholders. The NGSS, "Developing the Standards" (2013) states the NGSS are based off the *K-12 Framework for Science Education*, that defined the science children should know upon completion of high school to be successful in college and their future careers. Competencies in these standards can be developed through the curricular framework of the 5 E Model, created by the Biological Science Curriculum Studies (BSCS). The steps in the 5 E Model are: Engage, Explore, Explain, Elaborate, and Evaluate. The 5 E Model is a cyclical model designed to facilitate conceptual change by employing different teaching strategies, allowing the integration of multiple educational activities, and allowing the teacher to reflectively improve their practices with students (BSCS, 2006). The benefits of teachers using the 5 E Model is that instruction provides students with real-world knowledge, improving their skills in inquiry, synthetization of facts, and organization of knowledge (BSCS, 2006). It also has been shown to increase student engagement and agency within the classroom producing higher rates of academic success (BSCS, 2006).

Place-Based Curriculum

Place-based education is a holistic approach to learning that incorporates the experiences of the students, from the place they live, within their formal education (Sobel, 2004). Classroom content is embedded within the context of student's lives, providing meaning and purpose (Sobel, 2004). Sobel (2004) defines placed-based education as:

> The process of using the local community and environment as a starting point to teach concepts in language arts, mathematics, social studies, science and other subjects across the curriculum. Emphasizing hands-on, real-world learning experiences, this approach to education increases academic achievement, helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing members. (p. 7)

There are many benefits of place-based learning. According to Smith & Sobel (2010), children who have experienced place-based learning, develop a greater appreciation for the Earth and display increased motivation to perform and engage. They are more likely to perceive learning as meaningful and achieve at higher academic levels. These benefits have been observed even in children who are struggling in school.

Beyond increasing academic skills, place-based learning has contributed to the development of social skills such as collaboration, leadership, cooperative learning, and the ability to participate and contribute to small and large group discussions (Zandvliet, 2012). The increased engagement, motivation, and perceptions of empowerment contribute to children exhibiting more positive behaviors (Zandvliet, 2012). Place-based learning allows for children to share and gain perspectives from others, which enhances their ideas about concepts and issues. Additionally, because place-based learning is grounded in issues within a child's own environment and community, it helps develop the idea that they have the knowledge and power to influence positive change, contributing to their identities as a citizen of the world (Smith & Sobel, 2010; Zandvliet, 2012).

Language Assessment

With the increased focus on standardization and teacher accountability, the use of assessments has become a common practice within the field of education (Rushton, Joula-Rushton, & Larkin, 2010). The vast majority of language assessments in the United States use a

discrete approach to identify the language ability of students and does not allow adaptability for diverse students (Chapelle, 1999). Discrete assessment approaches are designed to easily measure in quantifiable terms a student's performance and is based off cognitive abilities that are easily discernable but not always reflective of a child's true understanding of language (Chapelle, 1999). However language is dynamic with many facets influenced by culture and values, aspects that cannot be reflected in discrete assessments (Chapelle, 1999). Language is complex and requires the integration of many rules that are connected to social and cultural communication (Ripley, 2013). Discrete assessments lack the capacity to capture the true essence of language and may not be best tools to assess and measure language competencies in children.

Unfortunately traditional, discrete assessments such as the Smarter Balanced Assessment Consortium (2013) tests taken during the elementary school years, do not adequately take the complexities of language into account and this results in biases (Ruston *et al.*, 2010). This translates into children being inappropriately labeled. In some cases, children have been so misevaluated they are placed in special education programs without adequate merit (Chapelle, 1999). The children who often struggle academically and do not perform well on the assessments are children from culturally and linguistically diverse backgrounds. The challenges and hardships in school create a great deal of struggle for these children and it has been shown these types of negative experiences in school can be traumatic, creating long lasting negative effects (Overton, Fielding, & Simonsson, 2004). This lack of acknowledgment of the impact of sociocultural experiences on a child's learning, unintentionally creates large achievement gaps and ultimately has resulted in separating minority students from Caucasian students (Mendoza-Denton, 2014).

The misevaluation of culturally diverse children has dramatic, detrimental, and long-lasting effects to the overall well-being and academic achievement of a child. Children who have been labelled as inadequate by standardized testing, primarily minority children, do not perform well in school and often do not achieve higher levels of educational degrees (Cohen, White, & Cohen, 2012). This educational inequality in children's school experiences quickly translates into income inequality as they become adults, further separating the society based on race (Albrecht & Albrecht, 2009).

With the increasing focus on academic achievement of preschool aged children, academic assessment reform must address the inequalities that are innately embedded within the way we assess children. The narrow focus of discrete assessments has placed children from diverse backgrounds at an automatic disadvantage. Rethinking assessment strategies may reveal ways to present all children with equal opportunities to succeed.

Formative Assessments

Formative assessment tools are used to assess growth in the students. Formative assessments encourage students to talk about what they do or do not know without the fear of penalization (Shelton, Smith, Wiebe, Behrle, Sirkin, & Lester, 2016). They allow children to be assessed within natural learning environments and do not impede on the learning, since they are part of the natural goals of the classroom. Many times, the goals of formative assessment are to inform instructional practices. The information gathered from formative assessments allow for the improvement of teacher practices and allow for better adaptation of the curriculum to the children's needs. The constant reevaluation of teaching practices and students' performance in real time allows for quick changes in the classroom resulting in fewer children being left behind and their struggles going unnoticed (Shelton et al., 2016). The following is an excerpt from the joint position statement from NAEYC & NAECS/SDE (2009) about appropriate assessment of young children.

> To best assess young children's strengths, progress, and needs, use assessment methods that are developmentally appropriate, culturally and linguistically responsive, tied to children's daily activities, supported by professional development, inclusive of families, and connected to specific, beneficial purposes. (p. 1)

Formative assessments may appear to be more time consuming and taxing than discrete assessment approaches by educators, however, it has been found this is not the case. Formative assessments are naturally built into the integrated studies and many times children do not even know they are being assessed. This offers more authentic data to track the performance of children (Shelton et al., 2016). In many cases children suffer from testing anxiety and their performance on discrete assessments is not a true representation of their knowledge (Huerta, Tong, Irby, & Lara-Alecio, 2016). Examples of formative assessment for young children may be drawings, transcriptions, and simple writing samples (Shelton et al., 2016). Formative

assessment techniques allow teachers to measure the performance of children to ensure quality while maintaining developmentally appropriate practices (Shelton et al., 2016).

Theoretical Framework

This study was framed by the sociocultural theory (SCT). SCT states that learning emerges from social and cultural contexts; where the learning is embedded within interactions with the external environment (Vygotsky, 1987). SCT recognizes that learning is not an individual endeavor but is a transactional process; where an individual's learning occurs through interactions with the environment and the people around, developing knowledge through social interaction and collaboration (Vygotsky, 1987). This promotes the scaffolding of new knowledge through the process of more experienced individuals guiding and supporting more novice learners (Vygotsky, 1987). SCT emphasizes the importance of language, as it is the vehicle to transmit and receive new knowledge and support further cognitive development. SCT also focuses on the concept of the zone of proximal development; a zone where learning and cognitive development optimally occur. It is through this lens of how children learn and the important role language plays in the development of knowledge that guided my study.

The theories of Vygotsky have become well-known and accepted within early childhood education. Studies have examined the role SCT plays within the early childhood educational. These studies support social learning because of its ability to foster inclusive settings that supports the learning of a diversity of learners (Mallory & New, 1994). Social learning also supports the development of vocabulary since it facilitates the transmission of knowledge between one another (Wang, Christ, & Chiu, 2013). Vygotsky's theories have helped educators to understand how children learn about the world around them. Using the SCT framework focuses teaching children things that are useful to them and provide learning experiences in meaningful ways (Robbins, 2009).

The SCT and review of the literature show that child learn through, relevant, hands-on, and meaningful learning experiences. There is potential for place-based science curriculum to create these types of experiences to support preschool aged children because of the benefits found during the early elementary years. It is hoped this research will provide support to defining high-quality early learning experiences and help fill the gap in research exploring place-based science during the preschool years.

Chapter 2. Methods

Qualitative Study

I designed this research as a qualitative study to capture the true nature of the setting, students, and my practices as a teacher. A qualitative study is the, "process of research as flowing from philosophical assumptions, to worldviews and through a theoretical lens, and onto the procedures involved in studying social or human problems" (Creswell, 2007, p. 37). Denzin and Lincoln (2005) stated qualitative research is,

> a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring them. (p. 3)

I chose to do a qualitative study because of the flexibility within the research process and opportunity to illustrate the whole context of the study. The data from this study was emergent in nature and I did not want to confine my findings to specific outcomes and goals, as I was not sure what kinds of trends would emerge. This allowed the data collection process to be fluid and follow the story of my students and myself as a teacher, without being limited within the confines of a specific outcome. To illustrate our story, I chose to do a case study to capture the nature of my students, myself, and our interactions with each other and the learning environment.

Case Study

I structured this study as a case study to take a holistic approach to understanding the relationship between place-based science curriculum and students' development of academic vocabulary (Yin, 2009). A case study allowed me to document and analyze the learning and growth taking place through the multidimensional lens of the sociocultural theory because I could capture not only what was occurring on an individual level, but everything as a whole. SCT recognizes learning as a transactional process, making it very dynamic in nature. A qualitative case study allowed me the flexibility to expand the scope of the data to capture all of the valuable moments where children were growing and developing knowledge. This prevented

having to limit myself to a narrow scope that would ignore valuable data that supported the development of my students' knowledge and contributed to their experiences in the classroom.

As I was a participant within my own research, a qualitative case study allowed me to situate myself within the context of the study. The SCT states knowledge is scaffolded from a more experienced learner to a more novice learner. In this study, I facilitated the scaffolding of knowledge and relied on my own judgement to identify the zone of proximal development for each of my students in an effort to optimize their learning. A case study captured my influences and interpretations within this study, and showed how my perspective and interpretations offered another dimension of meaning.

To examine the process of learning through place-based curriculum, I documented and analyzed data from multiple sources to identify trends occurring as a whole class, down to trends occurring on an individual level. Through a sociocultural lens, the whole and the individual are constantly interacting and influencing each other. Therefore, I wanted to collect data that would represent all facets of the research to help illustrate the most comprehensive view of what was occurring in my classroom. I looked at the class as a whole and how the place-based curriculum affected change. I also documented and analyzed data from a more narrow perspective by focusing on the social interactions between students, students and myself, students and the content of the curriculum, and students with the environment. On an individual level, I monitored students by examining their work and other ways in which they were individually displaying their knowledge. A qualitative case study was most optimum because it allowed flexibility to employ various data sources to help me to explain, describe, illustrate, and to enlighten me (Yin, 2009). To create a complete illustration of the environment, the students, and myself, I collected field notes, pictures, work samples, and voice recordings to analyze and identify trends and draw a conclusion (Yin, 2009).

I intentionally chose an emergent research design to align with the emergent nature of the curriculum. This allowed the flexibility to follow the interests of my students and to fully capture the learning that occurred. I did not know, prior to designing the research, exactly where the study would go. Therefore, I needed the flexibility to follow the story of my students. An emergent research design could capture all of the different elements that influenced an emergent curriculum and the multifaceted process of learning. I also did not know what would play a role

in guiding my students' learning. A research design that could evolve as my students evolved afforded me an approach to capture data in its most authentic state, providing me with information to draw conclusions about how the place-based science curriculum impacted my students' knowledge.

Participants

Prior to conducting the study, I received IRB approval. Consent was collected from the director of the school and all the parents of the children who were involved with this study. The name of the school was changed and pseudonyms were used to maintain confidentiality. The data collected was kept in a secure area where access was limited to myself. Number codes were assigned to the students to ensure their identities were not divulged throughout the data collecting process.

This study took place at a small, private nonprofit, center-based preschool that I will call the Sunshine Preschool. The school was NAEYC accredited however I observed standard practices not being followed quite often. The school used Teaching Strategies GOLD (TS GOLD) to assess the children, however teachers did not have formal training on how to use the assessment tool. This school is located in the heart of a large metropolitan city. The school serves families whose parents are employed with the government and some families who live in the surrounding areas. I had 22 students in all, 17 of them participated in the study because their parents provided consent. There were 11 boys and 6 girls. They ranged from three years and eight months to five years and two months old. There were four 3-year-olds; nine 4-year-olds; and four 5-year-olds. Table 2 provides the ages and names of the students within the study. I used pseudonyms for all the names of the participants to maintain their anonymity. The students in the classroom were of diverse ethnic backgrounds, which included Japanese, Caucasian, Samoan, Hawaiian, Korean, Chinese, Portuguese, and Filipino. They were from varying socioeconomic statuses, with the majority being middle-income. There were three students who received state funded aid and need-based scholarships awarded from local foundations.

Table 2

Ages and Pseudonyms of Students in the Study

3-years-old	4-years-old	5-years-old
Christi	Calvin	Craig
Carly	Marcus	Mark
Matthew	Daren	Trent
Taylor	Lily	Kyle
	Wendy	
	Haylie	
	Dane	
	Samantha	
	Charles	

Most of my students were new to the classroom. I had one student who was in my class the previous year, Kyle. None of the students, except for Kyle, had experienced placed-based science learning before. During the previous year with Kyle, the class did integrated studies surrounding the wildlife ecosystems in Hawai‘i. During these studies he was exposed to Tier 2 and Tier 3 vocabulary. Some of the content from our study on Hawaiian birds during the previous year carried over to the current study.

Prior to the research study I observed that all of my students enjoyed going outside, and had a natural affinity towards animals and exploring. This is what influenced my decision to implement an integrated study about birds as a form of emergent curriculum. I ended up calling it the Hawa‘ii Bird Study. I wanted to create a curriculum that encouraged the most authentic learning, so it was most natural for my students to do an exploration of birds. In the class prior to entering my class, the curricular themes were predetermined before the start of the school year by their teacher. Each month was a different subject and academic subjects were more divided where each skill was focused on one at a time. From my own observations there was not a heavy focus on science, except for a few experiments here and there. I did see them do a study on the

lifecycle of a butterfly and their class observed a caterpillar metamorphosed into a butterfly. However, other than that, I did not see any studies focused on the natural world around them.

During the large group discussions I had seven students who were usually did not participate, Calvin, Christi, Daren, Haylie, Marcus, and Matthew. Prior to the study, all of these students had demonstrated competencies in Tier 1 language, but I had not observed them utilize any Tier 2 or Tier 3 language. I only had one student who was usually more reserved, Christi. She was very shy, and often took the role of an observer or follower, but once she opened up she loved sharing with the teachers and some of the other students.

Kyle and Trent were the only two students who came into the class demonstrating an understanding of some Tier 2 academic vocabulary. Trent entered the class with very advanced language and literacy skills, able to read and comprehend books at about a 4th grade level. Kyle was familiar with some vocabulary related to the study as he was in my class the previous year.

Prior to the study, Dane, Craig, and Charles displayed some challenging behaviors. Dane and Craig's challenging behavior often occurred in group settings where the attention of teachers was divided among multiple students. Their behaviors included verbal or minor physical aggression such as, hitting, kicking, and inappropriate talk to both other children and teachers. However, both Dane and Craig displayed high levels of cognitive abilities and lots of motivation to explore and ask questions. They both thrived during activities that allowed more freedom and exploration without much teacher guidance but needed more scaffolding to support their self-control. Charles was the student who exhibited the most challenging behavior. He struggled working with other children, making transitions, and doing new or challenging activities. His behaviors would escalate quickly, beginning with verbal aggression and ending with very violent behavior towards other students and teachers. His behaviors included inappropriate language, hitting, kicking, biting, yelling, throwing chairs, flipping tables, and destroying class materials. At the beginning of the study, Charles appeared to struggle academically, as he was not willing to participate in many of the activities. By the time he was in my class his language skills were appropriate for his age, but at the age of 2 he was diagnosed with a speech delay, which may have contributed to his negative attitudes towards school. He attended Sunshine Preschool the previous year, in a different class, and he struggled a lot in that class too. The teachers were unable to help him regulate his emotions and learn how to express them in a non-physical or

violent manner. Charles was one of the biggest reasons why I wanted to explore new ways of structuring and creating learning experiences for my students. He was going to move onto kindergarten the next year, and I knew if I was not able to change something he would have many challenges as he continued through his schooling.

Throughout this study, I had some contact with families. Discussions with families usually took place during the times when the children were dropped off in the morning, and when they were picked up in the afternoon. I did not have much knowledge of what children's resources were at home.

Data Collection Procedures

Starting October 3, 2016 data was collected during the morning circle and morning small group activities. This was when the class focused primarily on the content of the Hawaiian Birds Study. Collection lasted from about 9:00 AM until 10:00 AM, three to four times a week, for 8 weeks. Some of the data was collected during critical incidents; times when students demonstrated a behavior that was critical to the study even though it may have only occurred once, as it offered critical information to help draw conclusions to the study (Cohen, Manion, & Morrison, 2011). Opportunities to collect data during critical incidents occurred at random times but often they were observed on the playground or during free play in the afternoon.

Data Sources

I collected data through researcher-participant observation. Data was collected, "within a natural setting, to capture students' everyday social settings and their everyday behavior" (Cohen, Manion, & Morrison, 2011, p. 491). I documented the data through hand-written field notes, photographs, student work samples, and voice recordings, which were transcribed. These methods of data collection were chosen to enable me to collect data during a variety of activities.

Field Notes. Field notes are the recommended tool to document the full context of a situation; providing information that can be analyzed (Phillippi & Lauderdale, 2017). I used field notes to collect data that depicted my students on an individual level, but also to capture external factors that had an effect on their learning. This helped me to see and understand connections between different elements of the curriculum and how it affected my students, and dive deeper into what prompted certain occurrences.

Voice Recordings. Voice recordings were used to aide in the collection of field notes. Voice recordings provided me with the means to collect data as a participant-observer without impeding on the interactions with the students (Cohen, Manion, & Morrison, 2011). Since I was the researcher and the teacher, I did not want the data collection process to disrupt the natural flow of classroom and discussions. Voice recordings were taken during large and small group activities, and also when I was having conversations with individual students. The voice recordings gave me the means to capture moments where I was able to engage and explore with students without worrying about taking notes. I transcribed the voice recordings, verbatim, at the end of week. After all the transcriptions were completed, I coded the transcriptions using open and axial coding to help me identify trends. In my recorded conversations with the children, they refer to me as Aunty, as that is culturally appropriate in Hawai‘i.

Student Work Samples. Student work samples were collected as a form of formative assessment because it "provides students with opportunities to demonstrate their knowledge, strategies, and motivation in richer ways than exhibited with traditional worksheets and tests" (van Kraayenoord & Paris, 1997 p. 524). These pieces of data were used as a way for me to track students' progress naturally to best capture their learning in an authentic way. I collected drawings, writing samples from students, and took photos of things they constructed and used it as a means to illustrate and understand the knowledge they were retaining.

Photographs. Photographs were chosen because they can truly capture meaning beyond what can be captured with spoken or written words. It conveys real-life depictions of events and can be used to supplement other sets of data (Cohen, Manion, & Morrison, 2011). Photographs helped me to capture the emotions and expressions of my students during activities, which helped me to understand the relationship between my students and the content of the curriculum. It also allowed me to document things my students had built and were used as another means to illustrate the knowledge they were displaying.

Circle Graphs. Circle graphs were used to document the children's knowledge during small group discussions periodically throughout the study. Circle graphs helped to determine previous knowledge children had and the level of understanding surrounding a particular concept. These graphs helped me to determine what my students knew, and later used as reference to see how they had grown.

Analysis of the Data

I used the data collected from the field-notes, photographs, student work samples, and voice recordings to formatively assess growth in the students. This style of data collection and assessment was chosen because students could talk about what they did or did not know without the fear of penalization (Shelton et al., 2016). This best captured the students' knowledge because the data generated was from natural and authentic encounters (Shelton et al., 2016).

Data analysis was ongoing throughout the whole study, so I could generate a complete understanding of how different themes emerged. The voice recordings were transcribed weekly and analyzed using open coding. Open coding is the process of labelling data based on different dimensions of meanings, ideas and thoughts that may support the research (Merriam, 2009). Open coding aided me in identifying the interests of my students and helped me to shape the direction of the study, as well as, note trends. After all the data from the eight weeks was transcribed and analyzed using open coding, I then used axial coding to help identify larger themes that emerged from the research. Axial coding is the process of grouping the open codes together to generate the overarching themes and identify long-term patterns. Appendix A provides a list of the open and axial codes used to find trends in the data (Corbin & Strauss, 2009).

I used the same coding process to analyze the handwritten field notes and the transcripts of the voice recordings. The work samples and the photographs were also grouped according to the codes to capture another dimension of the themes. All the data sources were analyzed using the same codes to triangulate the data. Triangulation is the process of collecting data through multiple techniques to produce a more accurate conclusion from the findings (Oliver-Hoyo & Allen, 2006).

Curriculum Design

This unit of study took place during the third month into the school year. The first month of school, August, 2016, was dedicated to getting all of the students comfortable in the classroom and acclimated to the new setting. We focused on learning the routines and rules of the classroom and getting to know each other. During this first month, I encouraged the children to explore all different kinds of materials. This exploration is what helped me to identify this class was very interested in animals and other living things. During the second month of school,

September 2016, we did an integrated study on insects. This was to help transition the children into more structured activities to help encourage them to explore and start learning how to ask questions. During this study many of the students' interests began to grow and I could see they were developing more curiosity about the natural world around them. During our study on insects, many of the students developed an interest in birds. Their interest in birds emerged when they learned some birds eat the insects we were learning about. After this discovery, when we would go outside and there were birds on our playground they were so excited and wanted to chase them and learn their names. This blooming interest was what inspired our class to transition into a study on birds.

To follow the interest in birds from my students, I designed an eight week, place-based, integrated science study on Hawaiian birds. The eight weeks were spread over about 3 months because of the holiday season. The study started in October of 2016 and ended December 2016. I decided to create an integrated study focused on science because it naturally afforded me the ability to integrate a variety of academic subjects surrounding content that was meaningful and engaging for my students. I aligned the curriculum to fulfill the following eight criteria created by NAEYC. I chose this set of criteria to ensure that I provided the students with developmentally appropriate, high-quality learning experiences.

1. Curriculum enables children to be active and engaged
2. Curriculum goals are clear and shared by all
3. Curriculum is evidence based
4. Curriculum content is learned through investigation, play, and focused on intentional teaching
5. Curriculum is built on prior learning and experiences use parallel structure
6. Curriculum is comprehensive
7. Curriculum is validated through professional standards
8. Curriculum benefits children

I designed the study on Hawaiian Birds as an emergent curriculum where the students' interests led the direction of the lessons. I did this with the intention of optimizing their learning through authentic experiences. The following curricular themes emerged; each theme became

the topic for a lesson within our study of Hawaiian Birds. Appendix B provides an outline of the lesson plans used throughout the place-based integrated study.

1. Exploring Birds within the Ahupua‘a System (1st and 2nd week)
2. Exploring Bird Adaptations (3rd week)
3. Habitats of Birds in Hawai’i (4th and 5t h week)
4. Becoming an Ornithologist (6th and 7th week)
5. Protecting Our Native Birds (8th week)

I designed each of the lessons to follow the five steps of the 5 E Model: Engage, Explore, Explain, Elaborate, and Expand to build a curriculum grounded in a framework to support my students meet the standards of the NGSS (BSCS, 2006).

Our school offered a full day program beginning the day at 6:30 AM and ending at 5:30 PM. I provided the whole class with structured activities focused on birds from 9:00 AM until 10:15 AM. This time was right after breakfast and before our morning outside time. From about 9:00-9:15 AM we had a large circle where, as a whole class, we would discuss the large ideas for the days and talk about different wonderings or findings from the students. From 9:15-10:15 AM we had center time where the students would break into their small groups of five to six students and have the opportunity to interact with different materials and play different games to help them explore. All of the activities and subjects of exploration were focused on questions from the students. There were four centers, each with teacher-created activities for the students to explore. Students would rotate through the centers. Some of the centers were activities from previous days, that the students could revisit again. To get outside of the classroom, each week of the study the class would go on a “Bird Walk” around the school to observe, identify, and track the birds. This was to help the students engage and explore more of the content of the lessons. From 10:15-2:30 PM we had outside play, lunch, nap, and snack. From 2:30-3:30 PM we had afternoon inside free time, where the students could revisit activities from the morning or explore different areas in the classroom.

The classroom had four different areas, the block area, home center, small manipulatives area, and loft area. The block area was supplied with a full set of wooden unit blocks for the students to construct different structures of their choosing. The home center was set up to like a home with furniture such as, refrigerator, sink, oven, chairs, a table, and dress up clothes. The

home center also had toys to supplement the children's play such as pretend food, dolls, keyboards, and phones. The class also had a small manipulatives area where there were puzzles, and different material to build with such as, marble works and Magnetiles. The fourth area was our loft area. This was a place that students could go to relax in a quiet place or read a book. This area had pillows, a soft carpet, and some stuffed animals.

There were three teachers, including myself, in the classroom to support the students as they explored. I was the lead teacher and I had two assistant teachers or aides in the classroom. My two aides would float around the classroom to monitor the students and support their learning. They usually took on the role of helping me to facilitate the learning at centers with activities the students had done before. Unfortunately, my time to collaborate with the aides about our curriculum was very limited so I was not able to teach them a lot of the content knowledge. They both were very involved and supportive of the integrated study and were able to facilitate students' learning during activities that I had modeled for them before. During our small group time, I was usually at one center the whole time. This was the time when I did most of the scaffolding of new knowledge to help the students deepen their understanding of different concepts. This was also the time when I recorded most of the data.

Role of the Researcher

I entered the field of early childhood education through a non-traditional pathway, after receiving my bachelor's degree in biology. I have always been drawn to the sciences, even as a child. I grew up very close to nature, having been given many opportunities to explore the outdoors with my family. Through these experiences I developed a love and passion to learn about the natural environment, and that encouraged me to pursue my degree in biology. I went into the sciences to learn more about the natural world around me in hopes of one day encouraging change. After finishing my degree, I discovered the immense influence early childhood education potentially can have on future generations and decided to change my career pathway. I felt the field of early childhood education was a place where I could utilize the knowledge I gained during my undergraduate studies, as well as fulfill my passions.

Since I am relatively new to the field of early childhood education, I was curious to learn more about how children learn, and beneficial and effective ways to teach children. Through a reflection of my own childhood, the learning experiences I remember best were those that took

place outside in the natural environment learning about things around me. I remember the outside as being engaging and stimulating, naturally encouraging me to investigate and find answers. It is still like that for me today. Those memories of exploring of the world around me are the experiences that have the most impact on how I envision learning. To be honest, in comparison to my own exploration, I do not remember a lot from what I did inside the classroom. This misalignment is what inspired me to learn more about how I could create the meaningful and long-lasting learning experiences, like those I had as a child, for my students. I wanted to learn more about how learning can still be meaningful and engaging while fostering knowledge that will support students as they progress through school.

After learning about the emergent nature of learning, through my own reflection and through child development courses, I knew I had to find research methods that could capture the evolution of this multidimensional data. Prior to this research, I did not have any experience with qualitative, emergent research designs but I soon recognized its affordances to capture authentic and multifaceted data. To best illustrate the story of my students and myself, I tried to capture everything. I did not want to not miss any pieces of data that could provide deeper insight into how learning was occurring in my classroom. Throughout the research, I remained very cognizant of all the changes and evolution of the classroom. Due to this heightened awareness, I was able to analyze the data with a deeper understanding. I was a part of this research. Therefore, there was value in my insight and understanding of my students. This brought depth to my ability to make conclusions about what was occurring and understanding how all of the pieces fit together.

During this study, I was the lead teacher of the classroom. To prevent influence from my own biases, I remained very thoughtful about how I was interacting with my students. The main role I played was to support to my students by scaffolding their learning through authentic learning opportunities. The advantage of an emergent curriculum was that most of the time I could naturally take a back seat to the learning. This allowed me to take a position of an observer and a supporter, not always the leader.

The 5 E curricular design allowed the students to explore before diving into anything in the study. It put the students' questions in the driver seat. The questions and comments of the students dictated how and what words were presented to them. Students were only presented

with new vocabulary when they asked, or if I could support their observations by introducing more precise vocabulary words. This allowed words to be presented within a certain context to give them real-world, concrete meaning. I did not praise the students or provide any kind of incentive when they demonstrated skills that supported the hypothesis of the study.

I was constantly documenting discussions with my students by taking voice recordings or writing down field notes. I transcribed the voice recordings weekly to ensure the context of the content was still fresh in my mind and I was able to code the data appropriately. I could closely track the progress of my students as well as, reflect on my interactions with them. By doing this on a regular basis, I could make quick changes to mitigate the influence of my biases. I also kept a researcher journal documenting successes and places to improve, as well as, things I need to stay mindful of while the study progressed.

Researcher Biases

One of the biases I come with is my own engagement and interest in the study. This positivity towards the content of the study had an influence on the students' interest in the content as well. I was engaged, and because I was engaged, this helped engage my students. I was asking them questions and creating conversations with them surrounding the content of the study. I tried to prevent too much influence on my students by allowing the children to be the leaders. I wanted their own enthusiasm to power the integrated study. I was exploring authentic and meaningful curriculum so it was only appropriate for me to take a facilitative type of role, but none the less, my knowledge and interactions with the students had a large influence on the findings from this study.

Learning is a social endeavor. Therefore, I could not completely remove myself from the learning. One of the important pieces of developing vocabulary is having adult-student interactions. Knowing I cannot fully remove myself from all interactions, I stayed very cognizant of my interactions and questioning to maintain a student-lead study. During this place-based study, because the content was so engaging for my students, I took the role of a supporter to support my student's finding by providing them the tools to investigate their questions. During their investigations I supported students by scaffolding new knowledge to enhance their observations and findings to dive deeper into the learning. Students were never given extra attention or praise for demonstrating skills or behaviors that supported the research

hypothesis stating, place-based science can foster the development of academic vocabulary. I presented new vocabulary or knowledge to the students only when it supported the learning that was already occurring.

I also come with a positive bias toward the science curriculum because I have a background in science. I am naturally a person who asks a lot of questions, which may have influenced some students. It was natural for me to follow the framework of the 5 E model because that is how I learn. This knowledge supported me in building a curriculum that was based on exploration. I was able to look at the questions of the students and trace back the knowledge and skills needed to answer their questions. My comfort with science curriculum made it quite easy for me to create a unit of study where the students were able to move from a big picture, down to more specific pieces, and then connect all the pieces back together again.

My knowledge about each of my students also played a large role in the study. It was through my own judgement that I identified the zone of proximal development for each of my students. I knew the strengths and weakness of each of my students. This helped me to identify what kinds of activities and lessons I could design to best support all of them. I knew which students were leaders, and which were followers. Through this understanding of their dynamics, I was able to utilize students who enjoyed being leaders to help facilitate the learning and help to encourage more passive students to become more involved in our class. This deeper understanding of the subjects of my study is one of the reasons the study was able to become emergent. I knew my students and therefore I could follow them and support them. Without that deeper understanding of who each of my students were, I would not have been able to cater the study to my students' specific needs and I do not think the place-based study would have been as successful.

A reflection of my own development of knowledge and passion influenced the way I perceive learning. I designed this research to explore authentic ways of learning and to capture the growth of my students through their journey of an integrated place-based science study. The data is intended to illustrate the story of their learning and bring to light the aspects of the curriculum that enabled its success.

Chapter 3. Findings

Overview

One of the major features about the design of this study was that I put the children's inquiries and interests at the forefront of the lessons. Through conversations and observations, my two aides and I did our best to identify questions that could guide the learning forward and help the students to continue to dive deeper. Table 3 displays the guiding questions during each of the lessons that helped my aides and I decide what the next lesson of study would be. There were multiple reasons why certain questions and observations were chosen to move towards a new lesson in the study. The most common reason we chose a topic was because most of the children in the class were asking about the same kind of information. We also decided on lessons based on knowledge and skills the children were displaying, making sure they had enough previous knowledge to start to piece concepts together.

Table 3

Progression of Lessons Through Guiding Questions

Ahupua'a	Adaptations	Habitats	Becoming an Ornithologist	Protecting Birds in Hawai'i
Why do birds look different?	Why do some birds have claws?	What do birds eat?	What birds in Hawai'i are endangered?	What can we make to protect the birds?
Why do birds have different feet?	Why do some birds have webbed feet?	Why do we see some birds and not others?	How can we protect the birds?	Why are some birds in Hawai'i endangered?

One of the benefits of doing a study around birds and living things is that there are so many ways to connect the content to previous knowledge and build on it. Living ecosystems are dynamic and complex, presenting many opportunities to learn and explore all different kinds of information. Studying the animals made the learning relevant and concrete because we were studying animals that were right in our backyard. This created a level of engagement that helped the students to progress in their learning and created a motivation to learn. This sense of engagement sparked a lot of conversations and questions from the children. Through these

conversations and questions, opportunities emerged for the teaching staff to begin to scaffold the development of new academic vocabulary. Table 4 displays the lessons and academic vocabulary in tiers that the students were using, as captured in the data.

Table 4

Academic Vocabulary Used Throughout the Hawaiian Bird Study

Lessons of Study	Tier 1	Tier 2	Tier 3
Exploring Birds within the Ahupua‘a System (1st and 2nd week)	Ocean Mountain River Valley Bird Mauka Makai		Ahupua‘a
Exploring Bird Adaptations (3rd week)	Feet Flippers	Webbed Claws Specific names of birds i.e., Myna and Zebra Dove	
Habitats of Birds in Hawai’i (4th and 5t h week)	Wood Branches Nest Tree	Shelter Burrow	‘Ōhi‘a Lehua Omnivore Herbivore Carnivore Scavenger
Becoming an Ornithologist (6th and 7th week)		Prey Scale	Ornithologist Binoculars Predator
Protecting Our Native Birds (8th week)		Mongoose	Endangered

Observations During the Study

Week 1 and 2: Exploring Birds Within the Ahupua‘a System. I designed this unit of study with the primary goal of building the foundation for the rest of the study. This unit provided meaning and purpose to the language and literacy curriculum by integrating it with

place and culture. To begin the unit, the class began to learn about the place where we live, through the lens of Native Hawaiian culture. I did this to make the connection between, science, culture, and place. As a resident of Hawai‘i, I believe it is important to acknowledge the host culture of the land and for children to understand the history of where they live. Native Hawaiian culture is so deeply rooted in the land, so I made the first lesson focused on an integrated study of culture and science, by inviting the children to learn more about Hawai‘i’s natural landscape through an exploration of the ahupua‘a system.

> the ahupua‘a is a long narrow strip extending from the sea to the mountain, so that its chief may have his share of all the various products from the uka or mountain region, the cultivated land, and the kai or sea (Alexander, 1891, p.105).

The ahupua‘a is a self-sustaining system with significant cultural relevance as it was the basis for ancient Hawaiian life. The unique aspect of the ahupua‘a system is that it could also be used to illustrate relevant environmental processes such as, the water cycle and ecological systems. Connecting the curriculum to the ahupua‘a provided meaning and purpose to the natural land and also presented opportunities for children to gain knowledge that would support the ability to understand environmental issues.

During this unit, the class focused on the different geographical aspects of the ahupua‘a and also connected them to the birds found in those areas. We first began by looking at a teacher-created poster to represent an ahupua‘a (Figure 1).

To start off the study we went on a walk around the school to make observations about the land around us. This type of walk later became what we referred to as our, “Bird Walks”. The initial goal of this lesson was to help the children learn about the different types of landscape found in Hawai‘i, such as mountains, rivers, valleys, beaches, and the ocean through an exploration of the ahupua‘a system. However, I found through this exploration of the different kinds of landscape, the children naturally connected what we were learning to their own lives. When we talked about the different areas within the ahupua‘a, the children started sharing about where they lived.

Samantha: Ooo I live by the ocean!

Matthew: Me too!

Me: Who else lives by the ocean?

Taylor, Charles, and Dane: “Me!

Me: Where do you think our school is? By the ocean or the mountains?

Samantha: By the ocean.

Through this discussion of place, the children found the meaning and purpose in learning about the land and the names of different geographical areas because they connected it to their own lives. They were engaged to talk about their own experiences and used the knowledge to share about themselves. They were able to use the Tier 1 vocabulary such as ocean and mountains to describe the areas where they lived. The vocabulary was useful and supported what they were naturally already trying to communicate.

During this part of the lesson, some of the children took a leadership role in guiding the discussions and this encouraged the participation of many students. Once one student began sharing about where they lived, it got the rest of the group excited to share where they live too. This discussion of where each student lived gave room for making observations about the differences between areas of the ahupua‘a system. The students realized it does not rain very much by our school, which is by the ocean. However, it does rain a lot in the mountains, as observed by some of the students who live there. From these observations, the students noticed patterns of weather; rainy towards the mountains, more dry towards to ocean.

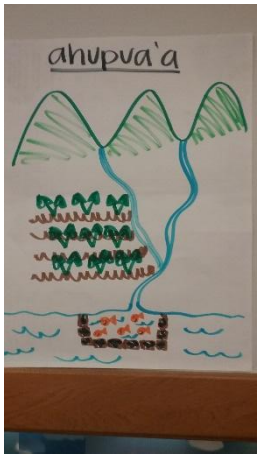


Figure 1. Poster of an Ahupuaʻa. This figure illustrates the poster that was created with the students in the initial discussions to give them an illustration of the different parts of the ahupuaʻa system.

After the initial exploration of the ahupuaʻa system, the students worked together to construct and paint a diorama of the ahupuaʻa. During this hands-on activity, the students reinforced the terms we had learned previously and applied their own knowledge by contemplating how we could appropriately construct an ahupuaʻa using recycled materials (Figure 2).

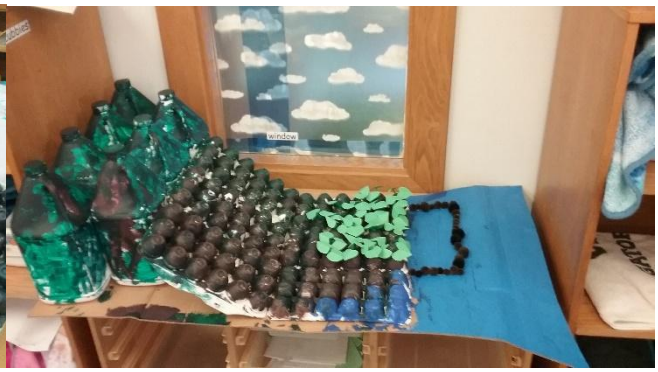


Figure 2. The process of painting the ahupuaʻa diorama. This figure depicts the process of the students working together to complete the diorama of the ahupuaʻa.

During this lesson was the first occurrence of the concepts from the curriculum appearing in the children's free play. The week following our study of the ahupuaʻa, Charles and Matthew started constructing an ahupuaʻa using unit blocks. After finishing the first construction of their ahupuaʻa, they called over the teachers to share what they had made (Figure 3). We asked questions to help identify what they had made, as well as to learn more about what they had retained from the previous lesson.

Charles: Look Aunty! We made a ahupuaʻa.

Matthew: Yay! Yay!

Me: Wow boys, you were really working hard in here! What are the different things you added to your ahupuaʻa?

Charles: This is the um, um the um, mountains, then it goes to the valley, then um um it's the ocean.

Me: Is there anything else you think you can add to your ahupuaʻa?

Matthew: ummm no!

Me: What do you think, Charles?

Charles: um, um…

Teacher: Would you like to go look at our posters and ahupuaʻa we made together to see if there is anything else you'd like to add?

Charles: Okay!

Figure 3. The first ahupuaʻa Charles and Matthew made in the block center. This is a picture of Charles and Matthew's ahupuaʻa that they constructed during free play in the block center.

The day after their first construction of the ahupuaʻa, Charles and Matthew made another ahupuaʻa in the block center (Figure 4). This second structure was far more detailed and incorporated aspects of the ahupuaʻa that were not previously added. When I talked to the boys again regarding what they had made, they remembered the river and trees. When sharing about their ahupuaʻa, Charles remembered the fact many trees grow in the mountains because that is where it rains the most.

Figure 4. Charles and Matthew's second construction of the ahupuaʻa. This picture is Charles and Matthew's second construction of the ahupuaʻa, after previous discussions with the teachers and looking back to reference models we had in the class of the

After constructing and painting the diorama the children were asked to try and make a picture of the ahupuaʻa and then use printed words to label the different parts (Figure 5). The art activity was used as a formative assessment to see what the children could recall on their own after our study of the ahupuaʻa. The children were taught the terms in both English and Hawaiian for mountain and ocean, because they are commonly used terms to describe directions in Hawaiʻi. It was found that nine out of the 15 students could verbally recall the parts of the ahupuaʻa: mountains/mauka, river, and ocean/makai, and beginning to utilize Tier 2 vocabulary. There were three students who could correctly identify and find the written words in English and Hawaiian for the different parts of the ahupuaʻa. One of these students entered my class reading at about a third-grade level, named Trent.

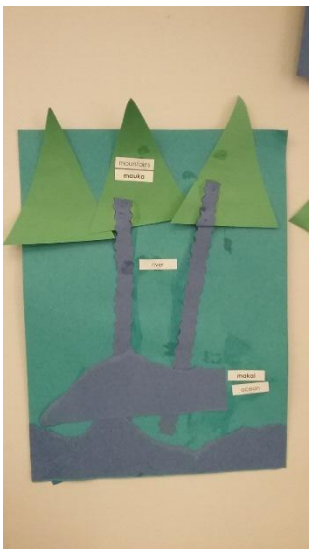


Figure 5. Picture of the ahupua‘a created by Trent. This is a picture of Trent’s ahupua‘a he made that depicts the different parts of the ahupua‘a with their labels.

The final lesson of the first week was an introduction to some of the birds that live in Hawai‘i; such as the I‘iwi, ‘Apapane, and ‘Elepaio. This was also the first time the children were exposed to the literacy cards, that I prepared, that contained a picture of the bird with the name typed below. It was found through this activity of matching pictures of birds on literacy cards to different kinds of habit that two of the students naturally observed differences in the body structure of the birds. Charles noticed the feet and said that they look like penguin feet. He then deduced that their feet are shaped that way because they live by water. Two other students had collaborated to figure out what the function of webbed feet is.

Me: This is called an Albatross.

Taylor: His feet look like duck feet.

Kyle: They are bird feet.

Me: What do duck feet look like?

Taylor: Flippers!

Me: Good, Taylor. What do you think the Albatross uses his flippers for?

Taylor: Swimming

Me: So where do you think he might live?

Kyle: In the water!

There were two students who usually do not display much interest or participation in group activities, Marcus and Matthew, who showed a lot of enthusiasm during our exploration of the birds. Matthew was very interested in the names of the birds after looking at their pictures.

Matthew: What's this?

Me: This is called an Iwa.

Matthew: Iwa! Yay, yay!! Um this red birds don't swim in the ocean. The bird is flying. He flies in the sky.

Me: Where do you think he is going?

Matthew: In the mountains.

Me: Yes, he likes to live in the mountains where there is a lot of rain. This is called an ʻAmakihi.

Matthew: ʻAmakihiiiiii Yayyyyy!

Marcus started to take notice of the letters in the birds' names. This brought him a lot of excitement and after finding his, "M" in ʻAmakihi he started looking for more of them in all of the other names of the birds.

Marcus: Oooo, ooo, Aunty, that spells my name!

Me: Yes, Marcus! ʻAmakihi, has an m, just like you!

It was during this activity that I finally found an activity that was of interest to these two students, Matthew and Marcus. Prior to this lesson, they had a hard time in group activities and usually showed little to no interest in the different activities that I or the other teachers presented them.

After observing the students' heightened engagement with the content of the study, we continued to investigate. The conversation with Taylor and his group began to spark a lot of interest in the way that birds looks and their different kinds of body parts such as different kinds of feet. From these inquiries, my aides and I decided that it would be natural for the class to start exploring more about birds' adaptations.

Week 3: Bird Adaptations. After Taylor's observation of the types of feet that birds have, the teaching staff decided to create a lesson surrounding adaptations of birds. The goal

was to present students with an opportunity to explore about birds more deeply, and also gave more opportunities to introduce Tier 2 and Tier 3 vocabulary to support the observations the children had previously made.

The children were tasked with looking at differences in body structures between birds and trying to figure out why they look different and how the structures help them survive. This discussion began during our small group circle time, done in groups of five to six students at a time. Students who volunteered participated in helping to make a circle chart that graphed the needs of birds (Figure 6). We began the discussion by reflecting back on the the observations students made during the ahupua‘a lesson and talked about the differences in the birds’ structures that they noticed. Then I asked the children why they think some of the birds look different. This began the discussion about what some birds need to survive. We then documented all the different things the students wanted to share about what they knew birds needed to survive.

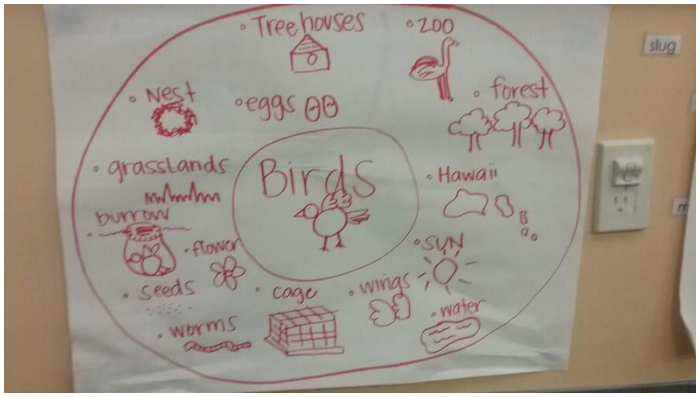


Figure 6. Circle chart: What Birds Need to Survive. This is a picture of the circle graph that was made with the students to document what they thought birds needed to survive.

The circle graph activity was an opportunity to document the base knowledge of the students. During this activity, there were three students that demonstrated the correct usage of Tier 2 language, such burrow and grassland. Kyle was in the class for the second year and I believe some of the knowledge he was displaying came from the previous year’s study because Kyle easily recalled some of the vocabulary and basic concepts taught the previous year. Craig and Trent also displayed knowledge of some Tier 2 language they had attained before entering my classroom. They both were fascinated with birds before coming to my class and were part of the reasons why we decided to explore more about our birds in Hawai‘i.

Kyle: “Birds need tree houses so they can use it for shelter from predators.

Craig: Some birds need burrows so they can hide from predators.

Trent: Birds in Africa like to live in the grasslands.

During this activity, two of the students used previous knowledge from the study of the ahupuaʻa. Samantha remembered some of the birds need the forest to live in and Taylor remembered in the forest there are ʻŌhiʻa Lehua flowers that some of the birds like to live by. The rest of the students demonstrated a good understanding of basic needs of living things such as water, sun, food, and some form of shelter.

The class then explored birds’ adaptations through two experiments. The first experiment was designed to explore the difference between claws and webbed feet. This was done to follow the children’s interests and allow them to explore more deeply the functions of the different kinds of feet that birds have. In their small groups, the children were given spoons and forks of differing sizes and asked to compare the ability of the forks or spoons to move water. During this activity, the children were beginning to utilize the new vocabulary words to describe what they were observing while interacting with the different tools and exploring the differences between claws and webbed feet.

Dane: The fork has little holes and the water can go back

Wendi: That’s because the claws don’t suppose to go in the water…they for scratching.

Dane: Scratching other animals.

The small group then had a discussion, after playing with the different tools, and it was observed that some of the student begin to logically piece together the function of the different shaped feet and come up with reasons to explain why webbed feet are designed for swimming and claws are better for grabbing and scratching. As a group the students looked at the literacy cards with the pictures of the birds to look at their feet, but then they noticed the birds had beaks that were different sizes and shapes. Then the lesson moved on to explore different kinds of beak shapes.

To further explore why birds have different shaped beaks, in their small groups, the children were given a box full of different shaped beads and blocks and asked to try and pick them up using different sized tongs (Figure 7).

Figure 7. Students playing the, "Beak Experiment". Students were given different shaped tongs and asked to try and pick out the different shaped objects and make observations about which tongs were easier to use for which objects and why.

Conversations with the students after they interacted with the activity showed they were drawing conclusions about the functions of bird beaks and beginning to understand why they come in different forms.

Me: Why do you think birds have different kinds of beaks?

Wendi: Because they can grab different kinds of things.

Dane: ...and pick up food!

In two of the small group conversations directly following the beak activity, some of the students began to discuss the implications of their findings in terms of how their beaks might realistically look in the wild. They talked about the specific kinds of foods the birds could possibly eat and discussed where birds with different beaks might live.

Conversation 1:

Me: Why do you think some birds have wide beaks and others have skinny beaks?

Craig: Because the skinny ones goes in the ocean and it could catch fish really good…the wide ones goes on the land for bugs.

Marcus: ...and ants! Ants are tiny!

Craig: In my house once I saw a cockroach and that kind of beak would eat it.

Conversation 2:

Kyle: The big beak was bigger and it could get more stuff so the bird could eat more.

Me: Why do you think they have different beaks?

Kyle: The birds need more objects of bodies…her could pick up more things than him because his beak is shorter. Like bugs and worms.

Taylor: ...and fish…maybe like a Red Masked Parakeet.

During another conversation, with another small group that day, Trent utilized vocabulary from previous activities and started to try and connect it to the learning from the beak experiment. Trent recalled the names of the different kinds of feet and tried to explain how that may connect to the beaks of birds.

Me: Why do you think birds have different beaks?

Trent: Because, because they have to pick up something with their claw or their web feet.

Me: What do you think the beaks help the birds to do?

Trent: Pick up stuff too.

The last activity of the Bird Adaptations lesson was for the students to use their knowledge about birds' bodies and draw their own birds. In Appendix C I have provided examples of some of the work samples collected from students. The students were then asked to describe their drawings to the teachers. Many of the students recalled the names of the birds, started talking about their specific body parts, and connected the parts to their habitats and needs.

Me: What did you draw?

Samantha: I drawed birds with webbed feet. It flied to my house from the ocean.

Hailey: This is a cardinal. I saw it by my house.

Christi: Me too!

Me: How did you know it was a cardinal?

Christi: It had a red face!

Lily: I made a Japanese White Eye. They live in trees. They have sharp claws not wet

flippers. Their tails help them balance on trees.

Me: What did you draw, Kyle?

Kyle: Albatross. They live by the water because they're water birds. They swim inside the water because they eat fish to feed their babies. They live by the ocean because they can't pick up sticks because they have webbed feet.

Just within one week of studying bird adaptations and allowing the children to reconnect with the learning from the previous weeks, students were beginning to produce and utilize Tier 1 and Tier 2 vocabulary, such as webbed feet, claws, and the names of the birds. They demonstrated an understanding of their meaning by appropriately using them in their comments and this allowed them to make deeper connections and more precise descriptions of their observations and drawings.

Week 4 and 5: Bird Habitats. The 4th and 5th weeks of the study were designed to incorporate the previous knowledge the children had learned to make new observations and conclusions about where and why the birds live in specific areas. At this point in the study, I designed the activities to function as a check-up point to get a general view of how the children were doing, and to see where the study would go next.

To begin the lesson, the class made a circle chart to discuss where they thought the birds lived. This activity also benefitted as a tool to formatively assess for the students' knowledge (Figure 8). When comparing the comments from the students in the first circle chart (Figure 6) about what birds need to survive, I found that the examples the students were now giving were more specific. The students talked about some of the materials needed to make shelter for the birds, Samantha said, "Some can fly and on islands they go on their nest." Some of the students appeared to have used knowledge from our previous lessons by talking about burrows, branches, and the forest.

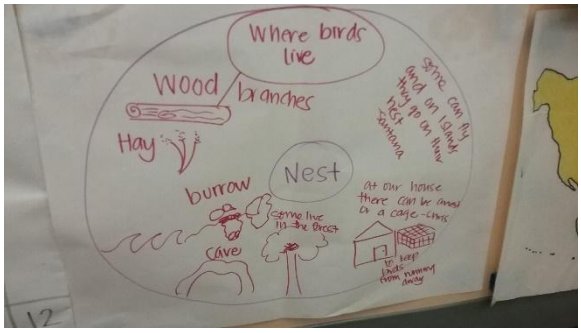


Figure 8. Circle chart: Where Birds Live. This is documentation from the small group discussions that incorporated students' previous knowledge about where birds live.

The study of habitats was an exploration of different kinds of environments. We asked the children to figure out how the different environments related to the adaptations of birds they had previously learned about. There were two kinds of habitats that were explored more deeply, the forest and the beach. The lesson was to connect the different kinds of adaptations they were learning about with the bird's habitat. Students showed the most interest in birds that live by the ocean and in the forest.

This lesson on habitats incorporated more art and construction projects to help encourage the students to make more detailed observations about the different habitats (Figure 9). I wanted to help center the children's focus on differences observed in flora and fauna. These two components were the easiest aspects of the habitat the children would be able to observe through their previous experiences.

*Figure 9.*ʻŌhiʻa Lehua tree constructed in the class. Before construction, the students discussed with the teachers about what materials were needed to construct the tree and talked about different animals that live in the trees with the birds. The unit before the bird lesson was bugs in Hawaiʻi. The students remembered the happy face spiders and those are also seen hanging in the tree along with the birds they constructed.

While learning about habitats, the children also learned about the diets of different kinds of birds. They learned the differences between carnivores, herbivores, and omnivores. They also learned about predators, prey, and scavengers. I presented these words to them through books and discussions in large and small groups. There are many aspects of animals that are related to their habitats so it was a good lesson to review previous knowledge, as well as build upon that foundation. I discovered, when studying the birds' habitats, the students began to connect the birds to their own lives, the geographical locations in the ahupuaʻa, and discuss their previous experiences and observations about the birds.

Christi: I saw a Myna birds when I was driving.

Craig: Sometimes birdies fly by my car so close. They fly right over my car!

Me: Why do you think they are all around us?

Craig: Because I see food everywhere. They eat trash so you better put your trash away and not leave it on the ground.

Trent: When I was going to get my hair cut I saw a lot of Pigeons on the telephone wire.

Craig: They sit up there because um, sometimes there's flower up there and um um they are hanging down from the wire on the street and um the birds will drink the nectar.

Following this conversation, as a class we discussed what defines a scavenger and then used Craig's example of eating trash to illustrate the meaning. Later that same day, I also had a ten-minute conversation with Kyle that displayed his utilization of the new vocabulary. He was asking about all the different birds we were learning about in class. After talking about the meaning of, "endangered" he concluded it had something to do with the colors of the birds. The examples of the endangered birds I had in the stack of literacy cards coincidentally were all very colorful, but even though that may not be accurate he was starting to make observations and come up with conclusions independently.

Kyle: I see a lot of white birds. The egrets. But I don't see a lot of those.

Me: Why?

Kyle: They're endangered.

Me: How do you know?

Kyle: I think because they're colorful…I think this (pointing to the Red Masked Parakeet) is endangered too. Because they cannot get those.

He also became concerned with the endangered animals and talked about coming up with ideas of how to protect the birds. From this conversation, we talked about predators and prey and how some of the animals we brought to Hawai'i have affected native animals.

Kyle: Let's learn the one endangered so we can know which ones are endangered so we can protect them. But first I need to find them…What's this?

Me: Albatross.

Kyle: They don't have any claws.

Me: You're right, they have webbed feet. Sometimes they have a hard time protecting themselves.

Kyle:Why can they not just peck them?

Me: Sometimes the predators come at night.

Kyle: Like what?

Me: Cats.

Kyle: Ohh because well they're sleeping. Well actually they're up. So they sleep in the day because they don't sleep at night, they hunt.

Me: Yes, because some cats are nocturnal, they come out at night and they are carnivores so the like to eat meat.

This conversation opened up opportunities to discuss what nocturnal is and also presented another example of predators and carnivores. Having conversations like this with the students allowed the teachers to present new words to the children in naturally occurring contexts. This conversation was also another example of allowing the child to make observations and the teacher presenting words for the child to use to explain what they were observing.

Week 6 and 7: Becoming an Ornithologist. Many of the students were becoming proficient at making their own observations about the birds and using their observations to make

conclusions; much like scientists. We decided to expand on these skills and have the class experience what it is like to become an ornithologist. We hoped the students could begin making more in-depth observations, as well as become aware of tools to make more precise observations. These activities opened opportunities to teach children new vocabulary to more extensively explain their findings. The class was challenged to make basic hypotheses regarding the length and weight of the birds and then use the tools to investigate. The student charted their findings on a graph and were asked to come up with some conclusions about the trends.

The first tool the class explored was binoculars. Many of the students already knew the function of binoculars from previous experiences from home and in their previous class. We had about six real binoculars in class that each of the students took turns with to explore with outside. After discussing what the children thought the function of binoculars was each student made a pair of binoculars out of recycled toilet paper rolls in class. The class had a brief discussion about where the toilet paper rolls came from and how we could recycle and reuse them instead of throwing them away. The students then constructed the binoculars and used them during our bird walks.

After making the binoculars, the class was so excited to go outside and look at birds. During the bird walk every student was engaged. They were using their binoculars and talking to each other about the birds they were seeing. During our previous bird walks, some of the students would begin complaining about the heat or they wanted to go back inside. However, during this walk, none of the children complained. Even when it was time to go back to the class for lunch, they still wanted to stay out. The binoculars helped to focus their attention on the task of observing birds, without teacher redirection.

After the bird walk the class had a group discussion about their observations. Many of the students began sharing the names of birds they observed outside of the school. Though this part of the lesson was focused on learning how to use different tools and discussing their observations from the bird walk, we observed students connecting the birds to their personal previous experiences. It was observed that as one student began to share his or her own experiences, this encouraged others to become involved with the discussion. Prior to the study, Daren and Haylie, usually never participated in group discussions. During this discussion, Haylie initiated the conversation and Daren contributed to the conversation.

Haley: Some birds are by the ocean and some are by the mountains and we can use the binoculars to see far away.

Daren: I see a bird. It was white on the street I see it with my own binoculars. Then I look across plenty streets by then he flew away into his own nest.

Taylor: When I was going to get my haircut I saw a lot of pigeons on the telephone wire.

Craig: They sit up there because, um, sometimes there's flowers up there and um um they are hanging down from the wire on the street and um the birds will drink the nectar.

The next tool the class explored was a measuring tape. The students learned that for ornithologists to understand the birds better, they catch the birds and take measurements. They learned that ornithologists need to be very careful with the birds to ensure the birds do not get hurt. For this activity we taped, laminated, accurately sized pictures of the birds all around the class and the students were split into small groups. Each group took turns finding the pictures of birds hidden around the classroom. After finding their birds, the students came back together and if they wanted, they could share something they liked or remembered about the bird they found. Almost all the students wanted to share something their liked or previously learned about their bird. These students displayed knowledge from previous lessons when sharing about the birds they found.

Kyle: The Egret is white and flies over here because I see the white birds.

Taylor: This is a I'iwi it lives in the trees by the flowers.

Dane: This is an Albatross. It lives in the ocean because it has ocean legs.

After each student found a bird, the students made estimations of how long they thought their bird was. The teacher then helped them to measure and record the actual length of their birds on a bar graph (Figure 10). The students recorded the lengths of the birds on the graph and made observations about the trends. This activity provided an opportunity to authentically integrate math concepts such as numeral recognition, quantifying, and greater and less than. The students displayed engagement through high levels of participation. It is also interesting to note

that during the graphing activity, students who normally do not like writing wrote their names on the class graph without any complaints.

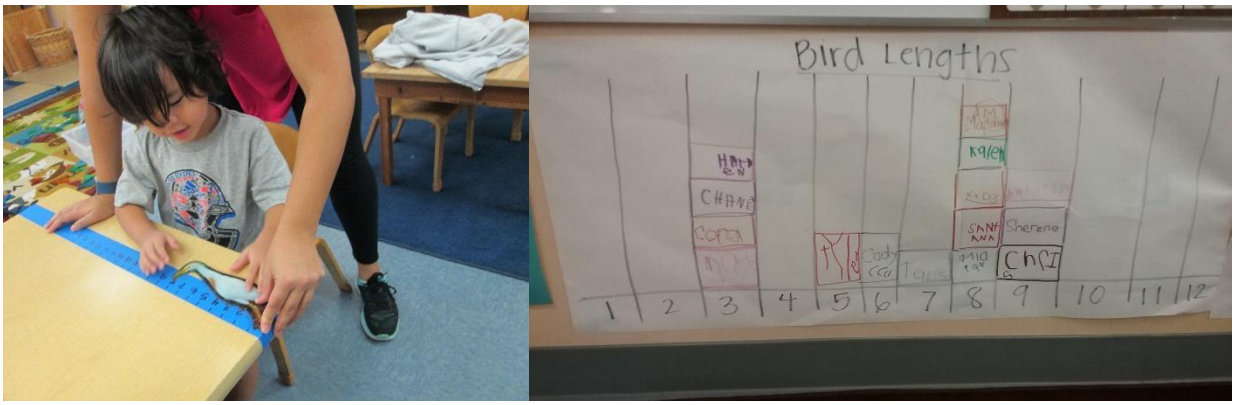


Figure 10. Measuring activity. (Left) Kyle measuring the length of the egret. (Right): Recordings of the lengths of the measured birds on the bar graph.

The last tool the class explored was a scale. In small groups the students made their own bag of bird seeds to take during our bird walks that occurred once a week during the study. After each student made their bag, they made guesses of who had the most and who had the least. They then used the scale to compare weights. During this activity students were observed taking turns and collaborating with each other.

To further explore functions of a scale, we made models of birds using socks full of rice for the students to measure. To begin the students were asked to make estimations of who had the heaviest and who had the lightest bird. They then tested their hypotheses using the scale to find the actual answers. It was observed again, that during this activity students were not fighting. All the small groups with five to six students demonstrated collaboration and participation.

During one of the last large group discussions of the *Becoming an Ornithologist* discussions, the students began to discuss why some of these tools are important. I started off the conversation by asking the class what an ornithologist does. During this conversation, the students started to reflect on their own experiences from the bird walk and talk about how the tools helped them.

Haley: Ornithologist have binoculars.

Taylor: They see stuff.

Kyle: They do with their binoculars so they can see stuff closer.

Craig: So they don't scare the birds and we can stay far away.

Dane: If you go too close they'll spy on you.

Daren: They will float away and then they will leave their babies and their nest. Yeah because the eggs always need their mommas.

During this same conversation, the children also began to describe the function of the tools more in depth. They were beginning to integrate the Tier 2 and Tier 3 vocabulary that was introduced during the small group activities such as binocular, scale, and ornithologist.

Teacher: What does an ornithologist do?

Craig: they measure the birds with a ruler.

Taylor: or maybe a stick.

Calvin: and a stander.

Teacher: good Calvin, yes, we call that a scale.

Calvin: yeah! A scale!

Samantha: or you can look to measure them to see how tall they are.

Taylor: you can count the birds!

Craig: um um ornithologist also um um figure out what kinds of birds there is and um um and how many different kinds of birds there are.

Mark: we weight the birds that are the same size and then we put them where one goes heavier and doesn't and one flies off and goes off to its nest and comes back.

This was one of the longest large group discussions the class had, lasting about 20 minutes. Though I initiated the discussion, the students carried the conversation. Students were excited to share their knowledge with the group. Though the discussion was longer than usual, students did not require redirection or support from the aides or I to participate. This extended conversation allowed students to think more deeply, and also encouraged them to listen to the ideas of others. This combination of listening and contributing ideas created a dialogue that was richer and allowed students to utilize their previous knowledge.

Week 8: Protecting the Birds in Hawai‘i. This last lesson emerged during the last large group discussion of the *Becoming an Ornithologist* lesson. The class had noticed that we never see the Albatross by our school. We discussed that they do not live in our area but they are also endangered. The students became very interested in why the Albatross are endangered. I shared with them that mongoose and cats eat the eggs and the birds. During this discussion, Dane began to reflect on story of the mongoose and the cats I had told them and started coming up with a plan to help the Albatross.

Dane: You don't want the mongoose to find it so you have to hide it. And then the mongoose doesn't know where the smell is coming from. Maybe they can make something to make the smell is coming from something else.

Mark: What about a cage?

Dane: Yeah like a small cage. But not a big cage with the big square so it can get out because if they were super small they could get out and then get the eggs.

Craig: For burrows to protect the birds that live by the ocean we can protect them by building their nest and digging a sand hole then put the nests in then um then um leave it open until the mongooses come and then the birds will see then fly into their nest and grow and put their eggs in the best and put their eggs in then cover it then the birds will go in then cover it with sand.

Dane: What if the mongoose is watching and the birds don't know?

Craig: They can't do that.

Dane: But then they can undig it. Cover it when the mongoose isn't looking.

This discussion was the first time I observed the students really listening to each other and contributing to one central idea. Dane's conversation was a clear example of this. He listened carefully and thought very critically about the ideas from his peers. When talking about the cage, he made the specification that the holes had to be small so the mongoose could not slip out. When he heard Craig's idea, he discussed how there might be flaws in the plan and talked about how to make it better by covering the burrows when the mongoose was not looking.

During this discussion, there was no teacher involvement. The students took control of the conversation. This was the first time where teachers did not have to provide any guiding questions to stretch the critical thinking of the students. They were guided by their own concern for the birds' safety.

During this eight week study, the development of academic vocabulary was evident in the conversations I had with my students and through the other ways they displayed their knowledge such as drawings and writing. I observed growth in my students not only academically, but socially and emotionally, and in their motivation to learn. The value of place-based, science reached far beyond the confines of the classroom by helping my students acquire knowledge that will hopefully, carry them throughout the rest of their lives.

Themes from the Observations

I found through analysis of the data that place-based science learning supported the development of academic language through authentic experiences because the learning was embedded within everyday life, providing an element of purpose and meaning. This finding lends support to address the first research question: "How can place-based science encourage academic vocabulary development?" These findings also show that beyond academic language students developed social skills, such as collaboration and self-regulation. The development of these social skills was due to the engaging nature of the study. The students demonstrated a motivation for learning, and therefore changed the students' attitudes towards school. These findings address the second research question: "What other kinds of outcomes, beyond academic vocabulary, may be produced from a place-based science study?" Finally, these findings suggest a critical eye must be used as the field of early childhood moves towards standardization and defining quality. However I believe further research in needed to adequately address the third research question: What are the implications for this research in defining quality of early childhood educational programs? This researched showed the immense growth that can occur through meaningful experiences and offers a new perspective on how learning in school is perceived. After analysis of the data, the findings offer support to answer the research questions through the following themes.

Place-based Science and Academic Vocabulary. I found during this study that place-based science provided a tool for me to foster academic vocabulary in my preschool classroom.

Appendix D documents the frequency of academic vocabulary words children used throughout the study. It was through the authentic nature of the study that there were many opportunities to scaffold an understanding of new vocabulary. The lessons followed the interests and questions of the students. Therefore, the new vocabulary words that I presented to students were meaningful and had purpose and context within their lives. After exposure to the new word the children began using it themselves during discussions and when making observations. An example of this is when the children were learning about the meaning of, "endangered".

Throughout the previous lessons on the ahupua‘a and the birds' adaptations the children were connecting the birds they were seeing in the class to the birds they had seen in their lives at home. From these observations, the I asked the children to try and figure out which birds they have seen before and which birds they had not previously seen. Through this reflection of their past experiences the students concluded they had not seen the following birds, I‘iwi ‘Amakihi, and ‘Apapane. These birds are endangered as well as native. This idea of "endangered" was easy to illustrate for the students because the students could relate them to personal experiences. After exploring the meaning of, "endangered" the students started to implement it into their own discussions. The following conversation with my student Kyle is an example of how he was beginning to utilize the Tier 2 and Tier 3 academic vocabulary to draw his conclusions about phenomena he was observing. Academic vocabulary from Tier 2 is bolded and academic vocabulary from Tier 3 was italicized. The words I categorized into Tier 2, are words that are used to communicate in academic settings but utilized throughout out all content areas (Snow, 2008). The words I categorized into Tier 3 words are used to communicate specifically within the context of science (Snow, 2008).

Me: Do we see a lot of these birds?
Kyle: No cause they're *endangered*.
Me: How do you know they're endangered?
Kyle: Maybe because they're colorful.
Kyle: I think this I think this is *endangered*.
Me: You're right. This is an amakihi.
Kyle: Because because they cannot get those?

Me: Right, because they are endangered we cannot get those.

Kyle: I know they cannot get this one. Is he *endangered*? What about this one?

Kyle: Okay let's learn the ones *endangered* so we can know which ones are *endangered* so we can **protect** them. But I first need to find them.

Even though Kyle's conclusion about why some of the birds were endangered is incorrect, he still communicated an understanding of the concept and meaning of endangered. He recognized that out of all the birds we were learning about there was a group of birds that we never saw. He was able to utilize his own observations and experiences to draw meaning and purpose to the word to use it to support his findings.

Another example of the children utilizing Tier 2 and Tier 3 is through a discussion they had about binoculars. This discussion took place at the end of the *Becoming an Ornithologist* lesson of the integrated study.

Me: What is something we learned an ornithologist does?

Hayden: *Ornithologist* has *binoculars*.

Talis: They see stuff.

Kyle: They do with the *binoculars* to they can see stuff closer.

Craig: So they don't scare the birds and we can stay far away.

Dane: If you go too close they'll spy on you.

Daren: Then they will float away and then they will leave their babies and their **nest**. Yeah because the eggs always need their mommas.

This conversation showed the children's understanding of what a binocular is from the perspective of multiple children. They displayed knowledge about the function of what a binocular does and they also showed how it can relate to helping the birds. This dialogue was unique because it was initiated by me however, many of the students contributed and carried the discussion forward without my support. The children were able to do this because the word, "binocular" had significance and purpose. Prior to this discussion the children got to experience using binoculars first-hand. I believe that is what enhanced their understanding of the word and when I asked the first question they were confident and eager to answer.

The meaningful and purposeful learning that emerged from the place-based science study enhanced my student's ability to understand the academic vocabulary because it put everything into context. They were presented with multiple learning opportunities through different experiences to understand the words and this helped me to support all my students, regardless of their various competencies. The children were able to utilize their own knowledge, based off previous experiences, to help support their understanding of the academic vocabulary. The authentic nature of the curriculum created a sense of engagement and purpose in the learning that became the vehicle for me to drive the learning forward.

Place-based Science Creates Authentic Learning Experiences. Using a place-based science curriculum produced many authentic learning experiences for the students in my class. Place-based science curriculum is naturally embedded within the everyday lives of children. The content is meaningful and engaging. Therefore, it is a strong foundation to build knowledge through a scientific framework, the 5 E Model. The learning that occurred through place-based science allowed children to utilize their personal experiences and observations. This gave my students the power to drive the direction of the study, producing high levels of student participation and academic performance.

Many of the authentic learning experiences I observed took place during free play. It was during those times, when the children had complete agency and control, that the authenticity of the of the learning emerged. Through play the children experienced hands-on learning that supported the individualized growth of each child (Rushton, 2011). I think the strongest example of authentic learning through free play I observed was through Charles' story.

His struggle in class prior to the study put a hinder on his ability to grow and learn. He had a negative attitude towards learning and refused to participate during most activities. However, during the place-based study there were multiple opportunities to engage with the curriculum in ways that even as the teacher I did not conceive. When Charles and Matthew were in the block center together building the ahupuaʻa, this was my first observation of the curriculum emerging in their play. Prior to the place-based study, these two boys were the hardest to motivate. Seeing them excited and engaged made me excited because I could see them growing through the learning but more importantly, because they were happy. One of the

major challenges I had with Charles is trying to change his attitude towards school. Though the place-based curriculum Charles could just be himself and explore.

The place-based curriculum was so grounded in the everyday experiences of my students that learning occurred all the time in authentic ways. This authentic and playful nature of the place-based curriculum supported my most challenging students to not only succeed in the classroom but also helped to change their negative perception of school into motivation and enjoyment.

Place-based Science Learning is Naturally Embedded in Everyday Life. Learning is ubiquitous within place. Grounding the learning in place makes every experience a relevant learning opportunity. The learning became natural and organic. Opportunities to learn did not have to be constructed or led by the teachers because students could learn through their own exploration. Utilizing a scientific framework enhanced the ability of place-based curriculum to develop academic vocabulary and skills because it pushed students to think critically about the world around them.

Science an inquiry based subject; a natural lens to investigate place. Science, similar to place, is ubiquitous. Grounding the curriculum in these two foundations, produced authentic learning experiences. The structure of the 5 E Model, supported the teachers in creating a study that was cohesive and consistent, yet still allowed flexibility for the students to be the main drivers of their learning. The knowledge was centered on student inquiry, resulting in high levels of engagement and participation.

Evidence of learning occurring in everyday experiences was best illustrated by the learning that occurred on the playground. No matter what my students were doing, if they saw a bird they would all stop to go watch the bird. This happened multiple times throughout the study. The first time, the class all went screaming after the bird, causing the bird to fly away. The next time the class saw a bird, Craig, told the class to be careful and quiet because last time they scared it. All the students cooperated to ensure they did not startle the bird. Once they were all able to observe the bird, the questions began. The class was totally fascinated. This level of engagement and inquiry became the basis for the rest of the study. This everyday experiential learning goes beyond what opportunities generated by teachers can produce. The

learning is contextualized and meaningful because it is embedded within the lives of the students.

A study on place utilizes the natural curiosity of children. These moments of independent exploration became the moments the teaching staff relied on most. Teachers could extend the learning during these times because the students were naturally invested and interested in the content.

Place-based Curriculum and the 5 E Model. Place-based content and the framework of the 5 E Model, complemented each other to create a meaningful and in depth study. Place functioned as the strong foundation to build knowledge through the scientific lens of the 5 E Model. The content was relevant and meaningful within the context of my students' lives. They were naturally engaged and wanted to explore making it easy to challenge my students to explain and elaborate. The 5 E Model systematically organized the naturally occurring learning into a cohesive study. This enabled me to formatively assess students by monitoring the academic growth emerging from these authentic learning experiences.

A place-based study grounds learning in the natural interests of the children. Birds are everywhere. Even before the study began, my students had some foundational knowledge and interests. The advantage of a place-based study is, it is able to utilize the intrinsic interests of children to drive the rest of the learning. To engage the class, we started the study by going on a Bird Walk. The Bird Walk was a great example of how place-based learning can harness the power of the natural environment, which is often underutilized. It already has all the components that children need to learn. It is hands-on, concrete, and relevant. My students were able to see, hear, and experience the birds. This automatically engaged my students and connected them to the content. Just by going outside my students were engaged. A place-based study recognizes the role a natural environment can play to support learning through authentic experiences.

The meaningful and accessible nature of the study made it easy to extend the learning. After just one Bird Walk, my students began generating observations and questions. They wanted to know things like, the names of the birds, where they lived, and what they ate. They did not have to be encouraged or pressured to ask questions. They were naturally

engaged because there was intrinsic motivation to learn more. The teachers were able to use the high levels of student inquiry to drive the rest of the study.

It was found, during the student's exploration there were many opportunities for teachers to scaffold new knowledge. The high student engagement resulted in many questions, which was used to drive the learning forward. During these times, there were many opportunities to introduce new words through incidental and elaborated exposure. Teachers were able to take the role of a supporter to the learning and follow the needs and interests of the students. This maintained an authentic learning environment while still focusing on academic growth.

After my students explored and learned new information they wanted to share, progressing the class into the next phase of the 5 E Model, explain. The best illustration of the class explaining their knowledge was during large circle discussions. During the study, the large circle discussions could last up to 20 minutes. Prior to the study, large circle discussions only lasted about 10 minutes. The extended length of the discussion is because many of the students were so eager to share what they had learned. Just with one question, a whole discussion was sparked. There were multiple volunteers who wanted to share what they had discovered. The students were speaking full of excitement and had so much to say. It was also interesting to find my students wanted to listen. I knew they were listening because they were engaging in conversation with each other. This was evident during Craig and Dane's conversation about how to best protect the birds. There was a clear dialogue between the two boys. During this conversation, they demonstrated their knowledge, through complex syntax structure and utilization of new vocabulary. Through this collaboration, they were also developing critical thinking skills by analyzing each other's comments.

My students were naturally challenging each other to elaborate and improve their ideas. They were basing their conclusions off prior knowledge, strengthening their conclusions through critical analysis. It was gratifying for me to watch the students take total agency over their learning. They were producing knowledge that was functional within the context of their lives. I could see the children were personally invested in the content of the study. They were identifying real-world issues and trying to come up with solutions. There was also a sense of care and responsibility that developed further investing my students in the learning.

The format of the study created many opportunities for teachers to formatively assess the children. My students were constantly demonstrating their knowledge. My students wanted to share their knowledge so there was not a need for a formal assessment. They were talking more, drawing more, building more, and writing more. These were all moments the teachers could use to formatively assess. This produced data that was authentic and a true representation of my students' knowledge.

Beyond assessing academic growth, the 5 E Model supported my ability to follow the interests of my students. The cyclical design of the 5 E Model allowed me to connect the learning taking place during a previous lesson to the subsequent lessons. This allowed me to drive the learning deeper at a pace set by the students. I used the steps of the 5 E Model to scaffold the learning not just within one lesson but throughout the whole study. This created a cohesive and in depth integrated study that was still student-driven and enabled me to maintain the high levels of engagement.

As previously discussed, learning through place happens all the time. It was found that the student's learning naturally progressed through the 5 steps of the 5 E Model. Place engaged my students and opened the door for science to extend and challenge my students. Designing a study on place within a scientific framework created a curriculum that was engaging and meaningful but still encouraged the development of academic outcomes. The learning was authentic and purposeful within the everyday lives of my students, creating high investment and engagement within the learning.

Place-based Science Supports Experiential Learning. Experiential learning greatly contributed to the success of this curriculum. Often times it is difficult to produce opportunities for students to learn academic material through experience. However, within a place-based science study, experiential learning was naturally embedded and it became the primary tool to build new knowledge.

A study grounded in place is easily designed to enable the children to learn through their own experiences. This is because of the authentic, hand-on, nature of place-based learning. The children are surrounded by the learning. It does not take fancy equipment or expensive, specialized tools to produce learning opportunities. In many cases, my class could just go outside. Learning was based on the student's own findings during the different

activities. Experiential learning enhanced the meaning and purpose to the academics, transforming it into something engaging and interesting.

Experiential learning supported my students in understanding academic concepts. Learning the meaning of words through experience is an example of this. The definitions of words become concrete and real-life, creating purpose for the new vocabulary. Some of the words my class focused on were the body parts of birds such as, webbed feet, claws, and beak. These vocabulary words were illustrated for my students by allowing them to experiment. They explored kitchen tools that we use for similar functions such as, tongs, spoons, and forks. This activity did not require anything fancy or elaborate. But it still allowed the children to experience the words and contextualize them. The information was produced by the students. It was not given to them by the teachers. The vocabulary words were functional and meaningful and I noticed after this activity, one of the first things my students would look for on a bird is if it had webbed feet or claws.

There was little to no encouragement required from the teachers, to get the children to share their knowledge. My students wanted to talk about their own experiences. They were engaged and motivated to participate in the conversations. Something I noticed that really enhanced the learning is once one student shared about their own experiences, it encouraged other students to share their stories. These were the moments when students, who typically do not participate, started to contribute and engage with the content we were discussing. When my students were sharing about their own knowledge, they were utilizing new vocabulary and complex syntax structure to connect more than one thought. Even though the academics appeared to be put on the backburner, it naturally emerged. It was found that experiential learning enhanced the academic learning because it contextualized knowledge. Students were motivated to learn more about the content because there was meaning and relevance within their own lives.

Place-based Science Supports a Student-Driven Lesson. Another aspect of place-based science curriculum that contributed to the academic success in my students is that it was a student-driven study. The content of place-based curriculum was naturally engaging thus, my students generated many questions. My students were intrinsically motivated to learn, which is often difficult to accomplish. The high levels of interest and inquisition, became the foundation I

used to shape lessons. This created lessons that aligned with the interest of the class and maintained engagement and investment. My student's natural curiosity became the fuel of the study. They wanted to investigate and find answers. The teacher's role became to support.

I noticed, through a student-drive lesson, some students began taking on leadership roles. This was observed in two students in particular, Craig and Dane. The role these two students played, almost replaced the teachers. During the large circle discussions, they would carry the conversation by sharing what they knew and asking questions. An example of this, is the conversation the two boys had during the last lesson of the study, "Protecting the Birds". Dane initiated the conversation by sharing what he thought we needed to do to save the birds. Then Craig contributed his idea. At the end of the conversation, Dane made suggestions on how to improve their plan. It was interesting that not only were they sharing their own ideas, but they were listening and collaborating, demonstrating self-regulation. The discussions these two boys had prompted other students to contribute and this helped to dictate the direction of the study

Place-based science puts students in control of their learning. This curriculum was able to utilize and enhance student engagement to encourage participation and growth. It also helped my students develop agency and self-regulation by providing them with opportunities to be leaders. This high level of investment from the students extended the learning, producing an in depth understanding of the content.

Place-Based Science Supports Engagement, Student Agency, and Academic Performance. The place-based science study utilized the power of student engagement to foster the development of student agency and academic performance. High student engagement was at the heart of the success of this study. High levels of engagement made it possible to create a student driven study which helped my students develop agency and self-control. This allowed them to become successful in the classroom and increased academic performance. The link of engagement, agency, and academic performance is best illustrated by my student Charles. Out of all my students he struggled the most. He had very low confidence, especially with academics, and this often resulted in lashing out towards the teachers and other students. I had meetings with his mother and she discussed with me her concerns about him not being ready for kindergarten because of his serve struggles in class. I knew his aggression was related to

frustration because the challenging behavior arose anytime he could not or did not want to do something. This made it very difficult to help him grow and succeed in class. During the bird study, I noticed a large change in Charles. Since the study was driven by the students it naturally went at their pace. The learning was about subjects he was naturally interested in, and findings were based on his own knowledge. This produced engagement, participation, and confidence. Charles benefitted from the active, hands-on, student driven nature of the learning that took place through the place-based science curriculum. Prior to the study, Charles did not even want to write his name. However, through this type of learning the teachers could integrate academics more naturally. This natural integration of academics helped Charles. It used his own strengths and curiosity to foster growth. During this study, he wanted to talk about the birds, he wanted to draw, and he wanted to write. The following is a picture Charles drew during the 6th week of the study (Figure 11).

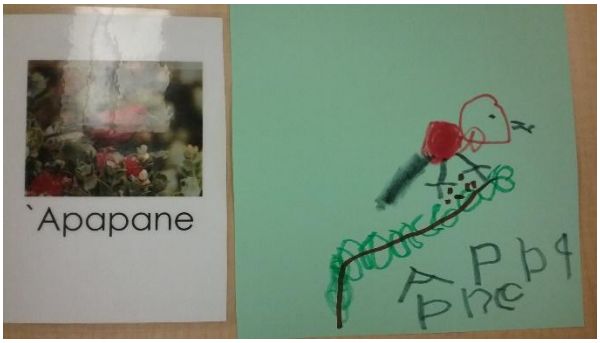


Figure 11. Charles' drawing of an 'Apapane. This drawing was done at free play during the 6th week of the study. He used the literacy card to aide his drawing and writing.

Charles' success in the classroom is a true testament to the power of place-based science curriculum. A place-based science curriculum does not require the teacher to ignore academics. It brings purpose and meaning to the learning with the context of children's lives. It affords teachers an opportunity to utilize the way children naturally learn to enhance academic knowledge. The teacher teaches children about subjects that have direct connections and impacts on their lives. Most importantly, it allows teachers to refocus the goal of teaching on the importance of developing children that love to learn. Showing children learning is ubiquitous within everyday moments encourages children to become lifelong learners.

Chapter 4. Discussion

Overview

The findings of this study call for a reexamination of how we teach children. Currently, there has been a large focus put on school readiness in preschool aged children; and we are now observing a shift from authentic teaching practices towards scripted, teacher-directed curriculum (DeBaryshe *et al.*, 2008; Eisenbach, 2012). A child's brain needs to be surrounded by authentic, real-life, hands-on, and meaningful learning experiences to promote the healthy development (Rushton, 2011). After review of the literature it was conceptualized that place-based science education could be the key to creating a curriculum that naturally embeds academics within authentic learning experiences. This study supports the assertion that through a place-based science curriculum, not only were students succeeding academically, but they were developing skills that will carry them throughout their whole life. My students displayed, self-regulation, collaboration, a strong sense of agency within their learning, and care for each other and the environment. It is hoped with further study and research, there will be a shift in policy and practice to refocus of curriculum beyond the confines of just succeeding academically, but to provide students with the abilities to become life-long learners and contributing members of our society.

Implications of the Study

It was found through this study that place-based science makes it possible to achieve academic outcomes through authentic learning experiences. Children learn within social and cultural contexts; aligning with the foundations of a place-based study (Vygotsky, 1987). If children are taught with a narrow focus on academic skills, their education is doing a disservice to them. Academics are just a piece of what children can gain through school and when academics are embedded within the lives of children, it brings purpose and meaning to the learning. The learning becomes a functional tool to navigate the world around them, not just a tool to pass an assessment.

The findings of this study suggest a shift in how learning is conceptualized within the classroom. With increased reliance on scripted curriculum, it is important to explore curriculum that can better support the ways children naturally learn. There is a need to shift away from the belief that academic learning is developed best through teacher-driven content and that it cannot

occur through authentic experiences that are created and led by children. The improved student outcomes that were observed during the place-based science study can mainly be attributed to the trust and value of the student's voices. Allowing children to become the drivers of their learning contextualized and brought meaning to the academic content. It created an environment that was intrinsically engaging to the children and they were motivated to learn. This type of engagement and motivation brought ease to teaching academic concepts by creating a positive learning environment that promoted the success of all children. It made it easy to foster opportunities for the students to develop the academic knowledge because the children were already invested in the learning. Teaching children academic knowledge is the most basic task of education; but why not strive for more? This study shows how powerful the learning within a classroom can become. If the scope of what children are expected to do in school is broadened so much more can be achieved. Standardized practices need to be reshaped and reexamined to ensure education is most effectively supporting students.

Limitations

This study only took place in one classroom, during one integrated study. I was the lead teacher of the classroom and also the researcher. This leaves room for many of my own biases to affect the data collection and analysis. Though I did my best to control for my own biases, because I played an active role in the research, there may have been some effects. Additionally, due to the variable nature of preschool settings there are many factors that affect the replicability of the study. These factors include demographics of students, families, and teachers, teacher knowledge and practices, and setting.

My class was very homogeneous, demographically. Students were primarily middle-income all coming from families that supported their children and their learning. None of my students would be considered at risk or were diagnosed with any kind of learning disabilities. This study also only involved 17 students, a very small sample. Therefore, this study captured a very specific snapshot of the population and findings from this study will not be generalizable to different preschool classrooms and programs.

This study was highly dependent on teacher knowledge and practice. My role as a teacher was to scaffold knowledge and shape lessons that enabled students to learn through exploration. I have a strong foundation in scientific knowledge and an affinity towards scientific

thinking. Therefore, I had the ability to scaffold new knowledge with ease. My scientific background also influences how I perceive learning and that affected how I shaped lessons. I tried to control for this through the utilization of the 5 E Model to systematically design the curriculum.

Teacher-student interaction was also a large component of the study. Therefore, the relationships between students and me as the teacher had an effect on the data. I could not completely remove myself from this study but I tried to control for this by creating an emergent curriculum that put the students in the driver seat. This allowed most of the learning to occur more independently of teachers. However, the interactions I had with my students did play a part in the how the learning developed.

The physical setting of the school played a large role in the study, since it was the foundation for the content of the unit. Therefore, the location had an effect on the findings of this study. This study was based in Hawai‘i, a place with access to lots of natural resources that enable children to learn easily through experience. The setting alone enhanced the reach of the curriculum because it was so embedded within everyday life. It could be argued that the place-based science curriculum was successful because of the setting of the school. However, the beauty of place-based science curriculum is that it starts with local knowledge, providing the flexibility and applicability to multiple settings (Smith & Sobel, 2010).

Future Research

Research on place-based science curriculum during the preschool years is very sparse. Due to the limitations of the study and some of the findings that emerged, there are many suggested avenues for subsequent research. It is hoped through continued research, there could be additional data to support the power of place-based science curriculum to support success in young children.

One of the findings from this study that was not adequately documented, but later I found to be a critical piece in the success of my students, was family engagement. Throughout this study I had two families in particular who expressed to me how much of the learning was coming home with their children, Wendy’s parents and Mark’s parents.

Mark’s mother said that she was so happy that the curriculum in class was focusing on the natural wildlife in Hawai‘i. She worked for the Department of Fish and Wildlife and one of

her majors passions is in wildlife conservation. She said Mark began to share about the birds we were learning about in class and they would make outings focused on looking for birds and identifying them. I wish I could have utilized her knowledge and expertise more in my classroom. I think that kind of partnership with a parent could have enhanced the lesson and presented another element of engagement and purpose to the learning. Parents are a child's first teacher. From what I observed, I think place-based science has the potential to create a space where parents and teachers can come together and collaborate. Through this partnership there are opportunities to enhance the reach of the learning and I think there is potential to learn more about how this supports children in the classroom.

Wendy's mother told me how impressed she was that Wendy was able to tell her all the names of the birds that she saw. She told me that she and Wendy had started making an, "I spy" game out of it and whenever they were outside they would look for the birds and try to identify them. Wendy's mother also told me that Wendy's older sister was coincidentally learning about birds in her class simultaneously. She told me this resulted in the two girls going outside to teach and share their knowledge about the birds with each other. After learning about what occurred between Wendy and her sister, I believe more can be explored. More can be learned about how place-based science can support educators to strengthen family engagement within their own students, but also more can be learned about the impact of place-based science at a system level. I am curious to explore more about the effects of implementing place-based science across all grades. Perhaps it could enable a deeper level of collaboration and depth of knowledge produced from home that may have positive impacts on the success of children in the classroom.

As an educator it was gratifying to hear from the parents that the content from the classroom was transferring to the home. However it was the strengthening of the relationships with the families that I enjoyed the most. It allowed the parents to become invested in their child's learning as well as, brought another element of purpose to the learning for my students. The shared interest, investment, and support that developed between the families and I created a type of bond that enabled us to work as a team for the benefit of the children. ESSA and Nā Hopena A'o highlight the importance of family engagement. I see the potential that lies within place-based science through its ability to open opportunities to develop powerful interactions

between home and school. Learning within school and home can become one and neither has precedence over the other. The learning works hand in hand, each enhancing the other. It would be interesting to explore more about how the increased family engagement through place-based learning impacts children and can be used to support our most vulnerable populations.

One of the largest limitations of this study is that it only examined a very narrow sample of the population. Unfortunately, this was not a clear representation the broader community of preschoolers. This suggests the need for a larger study that not only involves more children but also children from more diverse backgrounds and in different settings. It would be beneficial for the subsequent studies to have a larger sample size to increase validity and broaden the reach of the results. It would be interesting to see how place-based science can support diverse learners and children who come from marginalized communities since those are the children who may be able to benefit most.

Another needed area of research is professional standards and professional development for practitioners in the field of early childhood education. As the teacher, I had a large influence on the learning documented in this study. The field of early childhood is very diverse, therefore, there is a lot of variability in teachers. It would be interesting to research teacher qualities that support the success of place-based science. Most teachers in early childhood education do not come from a background in science. I am fortunate in that I have lots of years of experience learning about science through my undergraduate degree, and elective classes taken at a graduate level. However, my own educational experience is unique for the field of early childhood education. From my own personal experience, I know the knowledge I gained through those classes largely contributed to my abilities to carry out a place-based science curriculum. I do believe that with proper training even individuals who do not have a background in science can carry out this type of curriculum. However, it would also be beneficial to research professional standards and professional development that could provide teachers with support to develop the sense of efficacy and the skills to implement this type of curriculum on their own.

Beyond the limitations within my research, there were some themes that emerged which could possibly could be explored further in another study. These themes were higher order thinking, appreciation for the environment, and the development of growth mindset. Toward the end of the study there were many students demonstrating higher order thinking. Further research

could explore the specific components of the curriculum that encouraged the development of higher order thinking and how that promoted future success. Another finding from the research was students started to demonstrate an appreciation for the environment. This was seen during the *Protecting the Birds in Hawai‘i* part of the unit. There is opportunity for a future longitudinal study to explore how this curriculum affects environmental awareness and how that translates into adulthood. The last theme that was observed was the development of a growth mindset. Further research could help to understand how this curriculum supported student efficacy and promoted a growth mindset.

This study just scratched the surface of exploring the benefits of a place-based science curriculum. I hope this study can function as the starting point for future projects to learn more about how educational experiences are conceptualized and how place-based science can support all children succeed in school.

Chapter 5. Conclusion

The growth I saw occur during the place-based, integrated science curriculum exceeded my expectations, not only for my students' academic growth but across multiple domains. The data I collected supported my hypothesis that place-based science can support young children succeed in school.

I found through this study that by utilizing place-based science curriculum I could foster the development of academic vocabulary in my preschool aged students. I could do this because opportunities to support the children academically were authentic and natural. I maintained authenticity in the learning because place-based science is child-centered and grounded in the interests and questions of the children. Therefore, the content was naturally engaging for my students and this opened many opportunities to present them with new knowledge in authentic and meaningful ways. In addition to developing academic competencies they developed, social skills, student-agency and confidence, critical thinking skills, and a sense of stewardship for the natural world.

I hope the findings of this study encourage further examination of how learning is conceptualized in the classroom. Place-based science offers opportunities to support children holistically beyond the narrow scope of simply academics. I found there are so many positive impacts that grounding content in meaningful and engaging experiences has on the success of children. With the shift in early childhood education towards standardization, this study can offer a perspective on how children are taught and assessed and can contribute a piece of knowledge to ensure children are supported not only in school, but throughout the rest of their lives.

Appendix A

- Open coding
    - Utilizing academic vocabulary
    - Observe and conclude
    - Connecting to self
    - Utilize prior knowledge
    - Exclamation
    - Student initiated
    - Student elaboration
    - Student questions
- Axial Coding
    - Place-based Science Learning is Naturally Embedded in Everyday Life
    - Place-based Curriculum and the 5 E Model
    - Place-based Science Supports Experiential Learning
    - Place-based Science Supports a Student-Driven Lesson
    - Place-based Science Supports Engagement, Student Agency, and Academic Performance

Appendix B

5 E's, Place, Culture, and Inquiry – Based Lesson Plan

Birds in Hawai`i

Title: Birds in Hawai`i

Grade: Preschool: ages 3-5 years old

Time: 45 min, 5 days/week, 8 weeks

Standards:

NAEYC

1. Children are active and engaged
2. Goals are clear and shared by all
3. Curriculum is evidence based
4. Learned through investigation, play, and focused on intentional teaching
5. Built on prior learning and experiences
6. Comprehensive
7. Validated through professional standards
8. Benefit children

Nā Hopena A'o

1b. Belonging: I know about the place I live and go to school
2b. Responsibility: See self and others as active participants in the learning process
2c. Responsibility: Question ideas and listens generously
3e. Excellence: Explore many areas of interests and initiate new ideas
3f. Excellence: Utilize creativity and imagination to problem-solve and innovate
4g. Aloha: Share the responsibility for collective work
5g. Total Well-Being: Engage in positive, social interactions and has supportive relationships
6b. Hawai'i: Use Hawaiian words appropriate to their task
6c. Hawai'i: Learn the names, stories, special characteristics and the importance of places in Hawai'i

To the Teacher:

Young children must have opportunities to learn through real-life, hands-on experiences. These types of learning experiences can be achieved through place-based studies. Place-based studies, provide an element of relevancy and purpose to the learning that

encourages student engagement and agency. They explore issues within the local community and environment while integrating and developing academic skills. With the declining state of the environment and the importance of environmental education and conservation, place-based studies can be used to help children acquire the base of knowledge to address these issues. Currently all the native Hawaiian species of birds are on the threatened or endangered species list. There is an immense need for future generations to become aware of the importance of these species and understand how their survival affects a whole ecosystem. A study of birds in Hawai‘i can be used as the starting point to drive students' inquiry and exploration of environmental issues.

This study on Hawaiian birds was designed with the intention of providing students with a basis of knowledge that they can apply towards understanding natural ecosystems. Hawai‘i's unique natural environment offers many opportunities for children to learn. Hawai‘i is rich in biodiversity and natural landscape, which offers a real-life illustration of the ecosystems that exist where students live. It is hoped that through this lesson children will develop an interest and care for the natural world around them and they will strive to learn more about how to preserve and protect it. Understanding an ecosystem requires knowledge of the individual organisms and how they all interact and depend on one another. An engaging way to start to understand environment is to study the organisms that exist in areas where children live.

This lesson on birds in Hawai‘i was designed as a place-based science study that integrates all academic subjects. The goal of the curricular design was to create a study that incorporated the NAEYC and ‘E Mālama I Nā Keiki standards into a cohesive and meaningful curriculum. The integration of different academic subjects, through a variety of different hands-on activities, allowed children of diverse abilities to be able to partake in the lesson. This place-based study

was emergent in nature to offer the flexibility to create a lesson that brings meaning and depth into academic learning standards. During this study the children were challenged to develop their own questions and investigate to produce answers. This put the children in the driver's seat, and gave them opportunities to take ownership of their learning.

The teachers supported the learning by giving the children the freedom and tools to investigate their questions. Teachers scaffolded new knowledge that could support the children through their investigation and also recognized opportunities to integrate academic learning. It was hoped through this curriculum that children gained the skills needed when entering into elementary school, while more importantly gain a sense of agency and passion for learning.

This unit on, "Birds in Hawai`i" was broken down into the following lesson where each lesson went through the cycle of: Engage, Explore, Explain, Elaborate/Extend, Evaluate

1. Exploring Birds within the Ahupua‘a System
2. Adaptations of Birds in Hawai`i
3. Habitats of Birds in Hawai`i
4. Becoming an Ornithologist
5. Protecting Our Native Birds

Week 1 & 2 Lesson: Exploring Birds within the Ahupuaʻa System

Engage	
Activities	**Questions**
Bird Walk To begin the lesson children will be taken on a walk around the school to observe the birds. This activity is designed to create an authentic expose to the birds in Hawai`i and hopefully spark interest and inquire surrounding the birds. Children will also be asked to observe the landscape around the school. Make observations and predictions of what kinds of landscape are around our school and connect to what they see at home. Return to the class and present the literacy cards to the students and have them make observations.	Do you see any birds? Do you hear any birds? Have you seen any of these birds before? What are the birds doing? Why? What different colors of birds do you see? What shapes of birds do you see? Where do you think they live? Why? What do you think they eat? Why? What kind of body parts do they have? What do they use those body parts for? Do you recognize any of these birds? How do you know they are the same? Are there any birds you did not see? Do you know the names of any of these birds?
Introduction to the Ahupuaʻa System To introduce the students to the ahupuaʻa begin by talking about different kinds of landscape found around the school and their homes. The children are challenged with trying to see difference in weather patterns. The class then took part in drawing a poster for the classroom depicting the parts of the ahupua`a	What did you see as we walked around the school? What did you see far away from the school? Who lives by the mountains? Who lives by the ocean? What is the weather like near you house? Is the weather at school different than at your house?
Materials Bird Walk • Environment safe for children to walk and explore Introduction to the Ahupuaʻa System • Drawn picture of the ahupuaʻa	

Explore	
Activities	**Questions**
Water Play with Recycled Materials Used to Construct an Ahupuaʻa Allow the children to explore how water flows over different kinds of recycled	Do you recognize any of these materials? How can you make the water flow from this bucket to the other?

materials. Challenge students to make the water flow from one bucket to the other using the presented materials. Have children observe and discuss different characteristics about liquid water.	
Construct an Ahupuaʻa Diorama Using recycled materials (milk cartons, egg cartons, and cardboard) build an ahupuaʻa starting from the mountains, down the valley, to the ocean. Have the children look at the constructed ahupuaʻa. Challenge the students to make predictions about the different topographical parts of the ahupuaʻa by relying on their prior knowledge from the drawing activity. After a discussion about the different parts of the ahupuaʻa allow the students to paint the diorama	What do you think we have created? Why do you think we used different kinds of materials to build this ahupuaʻa? What do you think the milk cartons are supposed to be? Why? What do you think the egg cartons are supposed to be? Why? What do you think would happen if I poured water over the mountains?
Materials: Water Play with Recycled Materials Used to Construct an Ahupuaʻa • 4 water containers • Recycled materials: milk cartons, egg cartons, cups, and cups with holes Constructing an Ahupuaʻa Diorama • Recycled materials • Paint supplies and glue • Bird walk: record what children see • Literacy cards with picture and name of birds	

Explain	
Activities	**Questions**
Birds Within the Ahupuaʻa Begin by having the students make their observations about the finished ahupuaʻa diorama. Talk about the location of the school within the ahupuaʻa and the kinds of birds that were seen during the Bird Walk. Ask children about differences in weather and land from the mountains to the sea based off their prior knowledge. Talk about where different kinds of birds live and have the children make inquiries	Where do you think the school belongs within the ahupuaʻa? What kinds of birds did you see while on our Bird Walk? Where do you think your house would be in the ahupuaʻa? What kinds of birds have you seen by your house? What kinds of weather do you find closer to the mountains? What kinds of weather do you find closer to the ocean? Does one place rain more than the other?

and suggestions as to why they live in those areas.	
Materials: Birds Within the Ahupuaʻa • Ahupuaʻa Diorama • Literacy cards with pictures of bird and name	

Elaborate/Extend	
Activities	**Questions**
What Birds Need to Live After children have explored where the birds live, discuss with the students what they think birds need to survive. Create a circle graph to document their thoughts and predictions. Make bird houses with the children to illustrate the need of food and shelter.	What do you think the birds will need to live? Do all birds need the same thing?
ʻ **Materials** What Birds Need to Live • Milk cartons • Decorating materials • Bird seeds	

Evaluate			
Possible Vocabulary			
Habitat	Mountains	Valley	Predators
River	Stream	Rain/Precipitation	
Nest	Ahupuaʻa	Sea/Ocean	
Burrow	Shelter	Survive	
*Names of Birds (focused on throughout unit)			
Pigeon	Egret	Plover	House Sparrow
Zebra Dove	Spotted Dove	Cardinal	Myna
Java Sparrow	ʻAmakihi	ʻApapane	Elepaio
Iʻiwi	Nene Goose	Albatross	ʻIwa

Week 3 Lesson: Exploring Bird's Adaptations

Engage	
Activities	**Questions**
Bird Puzzles Present to the students puzzles of different kinds of birds. Introduce the names of different body parts. Ask the students if they notice any differences between body parts from one bird to another. Use labelled puzzle to allow children to match the number on their piece with a poster that has the name of the body part.	Do you see any differences between this bird and another? Why do you think they are different? Do you think they live in the same places? Why? What do you think they use this _____ (name of body part) for?
Materials Bird Puzzles • Draw and cut a picture of a bird • Create puzzle pieces by body part • Label body parts with numbers that correlate to a poster with the names of the body parts	

Explore	
Activities	**Questions**
Water Play with Spoons and Forks (Bird Feet) Have children explore characteristics of different kinds of tools in the water and explore its effects. First have children make observations about the tools themselves. They allow the children to use the tools in the water. Have children pay attention to which tool is better for moving the water and why.	What are the differences that you see between the fork and the spoon? What do we use forks and spoons for? Why do you think we use them for different things? Do you notice any differences between the fork and the spoon when you move them in the water?
Time to Eat! (Bird Beaks) Allow the children to pretend to be birds. Have them simulate how a bird picks objects up by using tongs to move different shaped beads from one container to another. Have one bucket filled with different shaped beads in the middle. Have smaller containers labelled with numbers so the	What did you notice when you were using the tongs? What tongs were easier to use? Why? What tongs were harder to use? Why? Did all the tongs pick up the same things? Why do you things that is?

children can move the appropriate amount of beads from the middle bucket to match the number of the smaller container.	
Materials Water Play with Spoons and Forks • Spoons and forks • Buckets or containers that hold water Time to Eat! • 1 large bucket • 10 small containers • 100 different shaped and sized beads • 4 tongs of various shapes and sizes	

Explain	
Activities	**Questions**
Observe Differences in Body Structure of the Birds After exploring the birds within the context of the ahupua‘a challenge the students to make observations as to why some birds live in some places and not others. Making observations about different forms of body parts and make connections to their habitat.	Do the birds that live in the mountains look different from the birds that live by the ocean? Why do you think their body parts look different?
Materials: Observe Differences in Body Structure of the Birds • Ahupua‘a Diorama • Bird Literacy Cards	

Elaborate/Extend	
Activities	**Questions**
Draw a Bird Allow children to draw pictures of their own birds. Allow them to use the literacy cards and other picture of birds around the classroom to help direct them as they draw. After finishing their drawing have them explain what they drew and display it on the wall.	What kind of bird/s did you draw? What are some of the body parts you added? What do they use it for?
Materials • Drawing materials	

Evaluate			
Vocabulary			
webbed	beak	chest	wide
claws	crown	wings	slender
*Names of birds			

Week 4 & 5 Lesson: Habitats of Birds

Engage	
Activities	**Questions**
Bird Walk Take children on another Bird Walk and have then pay attention to the environment. Talk about the different plants and resources around that they think help the birds to survive. Introduce names of the different kinds of plants.	What birds do you see? Do the birds look different than each other? Where do you think they live? What are the birds doing? Why do you think they are doing that?
Birds in the Ahupuaʻa Using the diorama of the ahupuaʻa revisit the different places where birds live. Review how the ahupuaʻa is divided into distinct areas. Have children describe how they divided the areas and talk about the different kinds of birds that live in those habitats. Talk about how those habitats enable the different kinds of birds.	When you look at the birds where do you think they might live? Why? What kinds of things do you think they would need to survive? Do the birds that live by the ocean look different than the birds that live in the forest?
Materials Bird Walk • nothing Birds in the Ahupuaʻa • Ahupuaʻa diroama • literacy cards	

Explore	
Activities	**Questions**
Create an ʻŌhiʻa Lehua Tree Talk about the parts of theʻŌhiʻa Lehua tree and how they help the birds to survive. Create the tree by allowing the children to paint and cut out the different parts of the tree.	What kinds of material do you think we will need to build our tree? What are some important parts of the plant?
Build Nests and Burrows Present children with different materials and allow them to create different kinds of dwellings for the birds.	Where are places where birds live? Why do you think they live there? Are their homes different? Why do you think they are different?

Materials

Create an ʻŌhiʻa Lehua Tree

- building and art supplies

Build Nests and Burrows

- twigs and sticks
- rocks
- bird models

Explain	
Activities	**Questions**
Circle Graph on Types of Habitats Have a discussion of the types of habitats where birds live. Draw out the comments of the children and label. Display the poster in the class so they children can revisit and discuss with others.	Where are some areas where birds live? Why do they live there? What are some things the birds need to survive?
Materials • paper for recording	

Elaborate/Extend	
Activities	**Questions**
Connect the Birds and the Habitat Have children draw and reflect on their previous knowledge and make connections with the birds' adaptations and the habitats where they live. Allow children time to explore through books and materials in the class and then draw their findings.	What kind of bird did you draw? What is it doing? Where do you think your bird lives? Why?
Materials • Drawing material • Literacy cards	

Evaluate			
Vocabulary			
habitat	nest	burrow	ocean/sea
forest	survive	predators	prey
mongoose	rats	native	invasive

Week 6 & 7 Lesson: Becoming an Ornithologist

Engage	
Activities	**Questions**
Make Binoculars Have children explore different tools that scientists use to study the birds. Talk about and explore binoculars to learn about their function and how they help us understand the birds. Provide children with recycled materials to construct their own pair of binoculars to use on the Bird Walks	What do binoculars help us do? Why would we use binoculars? How can this help us learn more about the birds?
Bird Walk Allow children to use their pretend binoculars, and take turns using the real binoculars as a tool to help them study the birds on the Bird Walk. Talk about observations and discuss things that we might need to know to study the birds.	Is there a difference when you use the binoculars? How can binoculars help us learn about the birds? Is there anything new that you noticed about the birds?
Materials Make Binoculars • toilet papers rolls (2 per child) • glue • paint/decorating materials Bird Walk • binoculars • note paper	

Explore	
Activities	**Questions**
Measuring Birds with a Ruler Provide children with laminated pictures of birds to measure using ruler. Help children learn how to line up the bird at the correct end of the ruler and count to measure how long. Also provide children with blocks they can use to measure the length of the birds.	What kind of bird did you choose to measure? How long is it? How many blocks long is it? Can you find a bird that might be smaller or bigger?
Measuring Bird Seeds with a Scale	Which bag has the most weight?

Provide children with bags of birds seeds that they can weigh using a scale. Have blocks the children can use to find how heavy the bags are. Possibly they can sort by weight.	Which bag has the least amount of weight? Which is heavier or lighter? How many blocks did you use?
Materials <u>Measuring Birds with a Ruler</u> • ruler • tape on a table marked by inches • 1 inch foam cubes • laminated pictures of birds <u>Measuring Bird Seeds with a Scale</u> • scale • pre-measured bags of birds seeds • wooden cube blocks	

Explain	
Activities	**Questions**
Collecting Data on Birds Have children use the ruler and scale and record measurements onto a bar graph. Discuss findings.	Which bird was the longest/shortest? Which bird was measured by the most/least amount of people? Which bag has the most/least amount of seeds?
Materials • large paper with premade columns • post-its for children to write name on • pencils	

Elaborate/Extend	
Activities	**Questions**
Using the Data Talk about why collecting data/information about the birds could be important and discuss any new questions or concerns the students may have.	What are people who study birds called? What do they try and learn? What would you like to learn more about?
Materials	

Evaluate			
Vocabulary			
ruler	scale	weight	length
longest/shortest	heaviest/lightest	most/least	more/less
ornithologist	binocular	numbers 1-36	

Week 8 Lesson: Protecting the Birds

Engage	
Activities	**Questions**
Bird Walk Talk about birds we see and birds that we don't see. Discuss why that might be.	What birds do you see? Are there some birds we have not seen at all? Why do you think there are some birds that we don't see very much?
Materials • pretend binoculars	

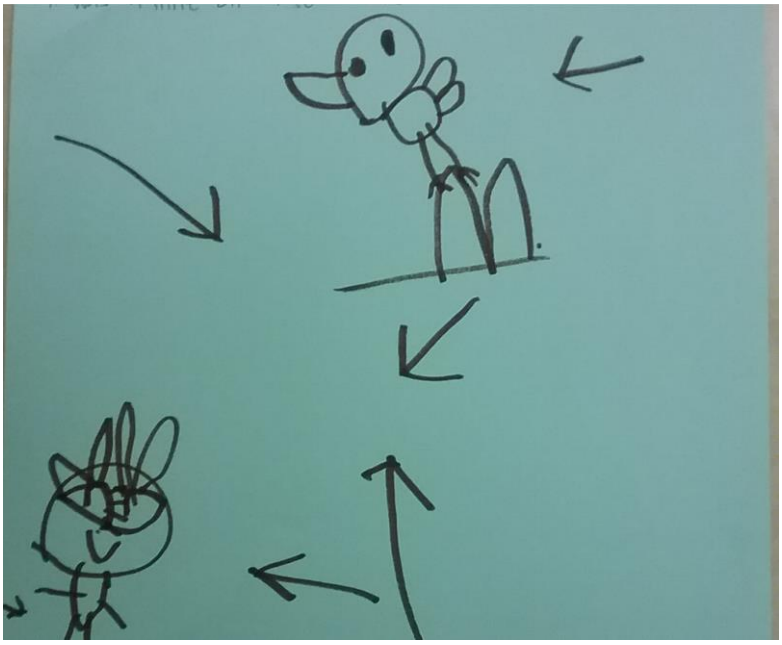
Explore	
Activities	**Questions**
Bird Tracking Have children use Bird Watching Books to track which birds they see and which birds they did not. Have them record in their books which birds they saw.	What birds did you see? Which did you see the most of? Are there birds you did not see? Why do you think there are a lot of some birds and very few of others?
Materials • create Bird Watching Book • pencils • pretend binoculars (if child wants) • bird seeds	

Explain	
Activities	**Questions**
Native vs. Invasive Species Discuss with children one of the reasons why we do not see the native birds species. Talk about the mongoose and rats and how they have been affecting the native bird species. What video about mongoose and rats taking the eggs of birds. Go outside and observe mongoose around school.	What animals did you recognize? Why do you think the mongoose may be hurting our birds?
Materials • video: https://www.youtube.com/watch?v=JLarD5vhdKk	

Elaborate/Extend	
Activities	**Questions**
Protecting the Birds in Hawai‘i Allow children time to discuss about ways that we can protect the birds in Hawai‘i and why it is important to them.	What can we do to protect the birds in Hawai‘i?

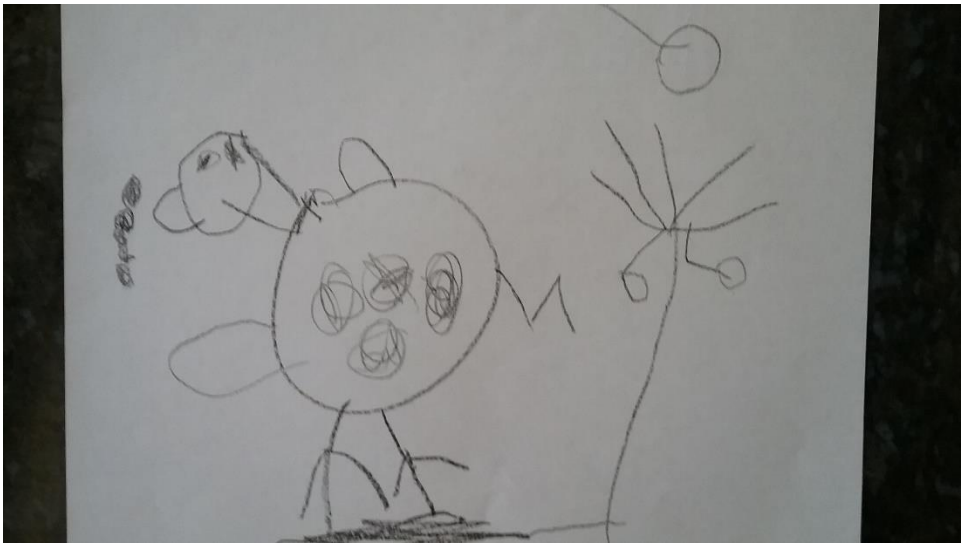
Evaluate			
Vocabulary			
endangered	mongoose	rat	common
rare	protection	shelter	extinction
predator	prey		

Appendix C

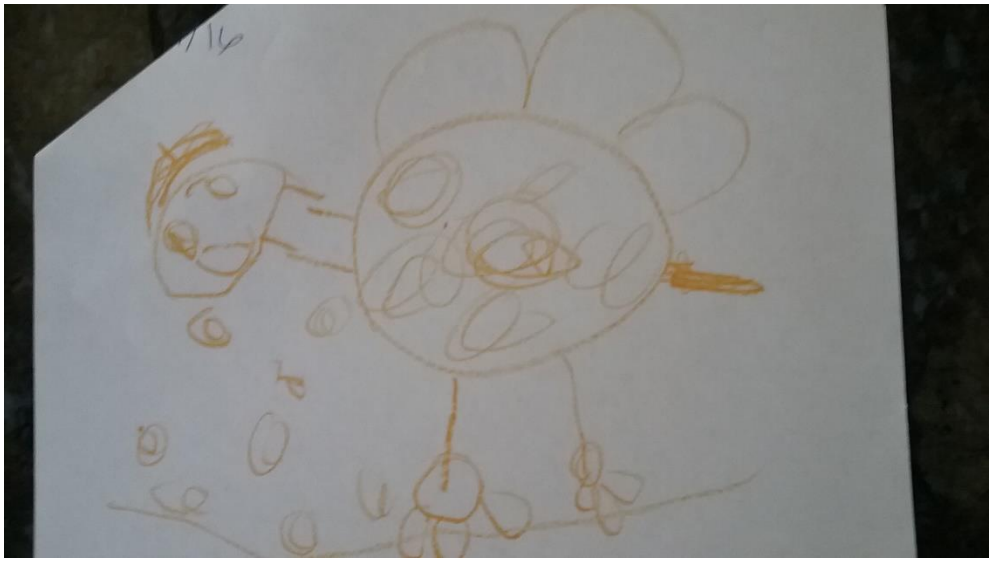


Work Sample 1: Samantha: "I drawed a bird. It flied to my house from the ocean."

Work Sample 2: Wendy: "I drawed a bird with webbed feet! I'll draw water. I drawed the bird eating fish."



Work Sample 3: Haylie: "'Apapane live by the flowers so they can eat nectar from the flowers like hummingbirds and butterflies. It's hard to find them and they live far away."



Work Sample 4: Lily: "I made a Japanese White Eye. They live in trees. They have sharp claws not wet flippers. Their tails help them balance on trees."

Work Sample 5: Kyle: “They live by the water because they’re water birds. They swim inside the water because they eat fish to feed their babies. They live by the ocean because they can’t pick up sticks because they have webbed feet.”

Appendix D

Frequency of Academic Vocabulary Used by Students During the Birds in Hawai‘i Place-Based Study

	Tier 1	Tier 2	Tier 3
Exploring Birds Within the Ahupua‘a System	Branch (3) Flower (2) Jungle (1) Mountain (8) Ocean (7) Plant (1) Tree (1) Valley (3)	Claw (1)	Ahupua‘a (5)
Exploring Bird Adaptations	Branch (5) Land (3) Seeds (5) Skinny (1) Tree (8) Wide (2) Wood (1) Puka (2)	Beak (5) Claws (5) Egret (6) Neck (1) Pigeon (3) Spotted Dove (2) Tail (2) Webbed (8) Zebra Dove (1)	
Habitats of Birds in Hawai‘i	Mountain (2)	Albatross (2) Egret (4) House Sparrow (3) Island (2) Myna (3) Nest (6) Nectar (2) O‘ahu (1) Pigeon (1) Spotted Dove (4)	‘Elepaio (1) Endangered (2) ‘Ōhi‘a Lehua (2)
Becoming an Ornithologist		Albatross (1) Cardinal (1) Common (5) Egret (3) Hawk (1) Japanese White Eye (4) Java Sparrow (3) Measure (6) Myna (16) Pigeon (6) Red Masked Parakeet (1) Rare (6)	‘Amakihi (1) ‘Apapane (2) ‘Elepaio (3) Endangered (2) ‘I‘iwi (1) Nene Goose (1) Ornithologist (5) Binocular (4)

		Spotted Dove (3) Weigh (2) Zebra Dove (5)	
Protecting Our Native Birds	Tree (5)	Burrow (3) Capture (1) Mongoose (8) Nest (2) Ocean (2) Protect (2)	Endangered (4) Predator (5)

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