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Place-Based Education and Teaching about Marin County Birds: Curriculum Development for Teachers

Sharon Anne Barnett
Dominican University of California

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Place-based Education and Teaching about Marin County Birds:
Curriculum Development for Teachers

Sharon Anne Barnett

Submitted in Partial Fulfillment of the Requirements for the Degree

Master of Science in Education

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Signature Sheet

This thesis, written under the direction of the candidate's thesis advisor and approved by the chair of the master's program, has been presented to and accepted by the Faculty of Education in partial fulfillment of the requirements for the degree Master of Science. The content and research methodologies presented in this work represent the work of the candidate alone.

Sharon Anne Barnett
Candidate

May 1, 2009

Madalienne Peters, Ed.D.
Thesis Advisor

May 1, 2009

Madalienne Peters, Ed.D.
Director, Master of Science in Education

May 1, 2009

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ABSTRACT

Compelling evidence illustrates place-based education (PBE) as a catalyst for inspiring teachers to create dynamic curricula that energizes the student. PBE curriculum typically encompasses all traditional subjects and entails hands-on classroom and field studies utilizing the natural world and local community. The purpose of this literature review is to introduce and explain the benefits of PBE. Specifically I will summarize and evaluate PBE science curricula with regard to Marin County bird species.

The literature review outlines four components: an introduction to PBE, information about the birds of Marin County, examples of current PBE in Marin County, and interviews with Marin County educators that are presently teaching about the local birds of Marin. Summaries of bird curricula available through local and national organizations, and through academic research are also included.

This paper serves as an introduction and explanation of PBE and identifies and evaluates PBE science curricula with regard to Marin County bird species. The ultimate goal of this review is to furnish educators with organized and easily obtainable natural history information, curricula and resources about Marin County birds.

CHAPTER 1 INTRODUCTION

Young children have an affinity for the natural world. They engage their five senses by seeing, hearing, touching, smelling, and tasting plants and animals to learn about the world around them.

One's conception is usually limited by what one has read or has been taught. Learning through real world experiences is significantly different than learning from textbooks. Seeing a local bird in the schoolyard is a richer experience than looking at a photo of an exotic bird in a book. Equally engaging is the hands-on experience of an interdisciplinary school garden project verses reading assignments about plant biology and gardens.

Traditionally a school hires an outside party to design their garden and hires a garden teacher to implement lessons. I imagine this scenario: the community's landscape architect visits the math class and assists with the garden layout. During history class, students visit the local lumberyard to learn about the history of logging and sustainable wood choices. Native plants, vegetables, herbs and pesticides are discussed during science class, followed by a field trip to the local nursery. In the end, students harvest the bounty of their garden for a delicious homemade pizza. This is an example of a hands-on learning experience that addresses pedagogy of place; also known as place-based education.

When I began teaching science outdoors I noticed a particular phenomenon. Children could rattle off facts about the exotic animals featured at the local zoo or seen on television. But they knew very little about the common wild animals living in their own backyard. Additionally, I noticed that after being introduced to local wildlife, students were enthusiastic and inspired to learn more.

As I became familiar with the local schools I began to notice a common thread- science instruction at the elementary age often overlooked the local community as an integral and tangible place for implementing curriculum. For instance, many educators teach a unit about the tropical rainforests, a faraway ecosystem. The problem is most students will not visit a tropical rainforest while in elementary school. They will not see the colorful birds, hear the Howler Monkeys, smell the rotting vegetable matter, or feel the humid mist upon their face. And on the weekend, they will not have the chance to lead their parent by the hand through the rainforest sharing the wealth of their new knowledge and excitement.

It goes without saying tropical rainforests are extremely important ecosystems worthy of study. But why not first teach about the local forest found adjacent to the schoolyard, and then teach about the rainforest for a comparison?

With the many distractions modern technology brings, it is in the best interest of the student and teacher to include tangible learning experiences when exploring science curricula. I have introduced countless children to the local flora and fauna of Marin County. The result of this authentic PBE stimulates interest and prolongs engagement of science throughout the school year and sometimes beyond.

The idea of PBE may sound attractive and at the same time overwhelming. It is important to recognize PBE as an approach that can begin with a single discipline, for example science, and over time it can grow to encompass more disciplines. Take the topic of birds, for example. Birds are very easy to see and hear and most young children enjoy seeing them. Even if the teacher is unfamiliar with birds and has not dabbled in PBE, both teachers and students can enjoy learning about birds together. Children can learn science through studying birds. Once the teacher is comfortable they can begin to add other components such as history, geography, and English LA. One recent example of this dynamic comes to mind.

First grade students at the independent school, Marin Country Day School, study birds from March through June. The class spends the first few classes outdoors looking for birds on campus. They focus on learning how to identify the different bird species by looking at the color, shape, and size of the bird's beak, legs, feet and body. Posture, field marks, behavior and the habitat the bird is in are also clues that help the students pinpoint the different species. The teacher creates a species list of all the birds seen on a large piece of chart paper and attaches photos of each one. Mid-way through the unit each student chooses a bird to research from the class list. The study culminates with a conservation component. Science, history, geography, English-language art, art, and conservation were all woven into this three-month unit. And to the surprise of many, the teachers are usually as unfamiliar with birds as the students. Therefore, they learn about birds simultaneously with their students, resulting in an exciting classroom dynamic.

Birds are ideal to study in school classrooms because they are beautiful, accessible and they are ever-present, according to the Bird Education Network (BEN) (see Appendix). BEN states:

Why birds? Birds pull so much together. Learning about birds is more than learning about a single season, type of animal, or habitat. Birds teach us about how we're all connected and how vulnerable our environment can become. Birds live among us...and us among them. (BEN, Why birds? section, para. 8)

Statement of Problem

Elementary students often learn about intangible global science concepts like endangered species and tropical rainforest ecology, instead of first learning about their sense of place in their surrounding environment and then moving on to broader subjects. This occurs for a host of reasons, one reason in particular is the use of mass produced textbooks.

Traditional schools often adopt textbooks developed for a wide audience and aligned to the California State Science Standards. Most textbooks contain photos and curricula featuring remote places like the tropical rainforest and exotic species such as cheetahs, giraffes and kangaroos. As unique and important as these places and species are, most elementary age children will never visit such places, nor see, hear or touch the featured animals.

Moreover, exotic bird species like cardinals, toucans, and penguins often don the pages of textbook. But the reality is California children will never see those birds in their backyard or at their schoolyard feeder. Learning about bird species other than what exist in a student's community results in a missed opportunity. The student misses the opportunity to connect with the real thing.

When a student learns by doing, in this case by tangibly seeing and hearing birds, she/he becomes interested and begins to ask questions. This is the beginning of student-centered learning, fueled by their interest and facilitated by the teacher. PBE provides a sense of place by initiating valuable hands-on learning experiences that span multiple subjects and encompass the immediate natural environment and local community.

Purpose Statement

The purpose of this literature review is to introduce and explain the benefits of PBE and to identify and evaluate PBE science curricula with regard to Marin County bird species. The ultimate goal of this review is to furnish educators with organized and easily obtainable natural history information, curricula and resources about Marin County birds. Providing an organizational structure such as this would relieve educators from hours of research, bolster their knowledge about the natural world, and improve their overall confidence pertaining to teaching science. This would essentially launch educators into PBE.

Research Questions

The research question that emerges out of this field of inquiry is: What are the resources available locally to form a curriculum that provides teachers with background and materials to begin science exploration with young students on local birds? How can this curriculum take advantage of the concept of PBE, a process that engages students actively on a topic that is close to their personal everyday local experiences in the natural world?

THEORETICAL RATIONALE

On the word of Sobel (2005), “PBE is 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” (p. 7). PBE is an education philosophy rooted in environmental education (EE) and is also known as place-based learning, environment-based education and education for sustainability. It is also sometimes referred to experiential, or service, learning.

PBE is adopted from environmental education and community development, but it has greater depth. For instance, traditional EE programs introduce children to global scientific concepts and environmental awareness and appreciation. Sobel (2005) states:

Environmental Education grew out of the Nature Studies movement of the early twentieth century and traditionally focused on learning about the natural sciences- field ecology, nutrient cycles, plant and animal taxonomy. But in recent years, environmental education evolved into issues and catastrophe education- learning about the rainforest destruction, ozone depletion, toxic waste, and endangered species. (p. 8)

Traditionally a class is immersed in the ideology of environmental education during a weeklong visit to a special natural setting. Often students return to their school and begin a new unit. The weeklong EE experience is nothing but a memory. In contrast, a classroom rooted in PBE utilizes a local natural community as an outdoor classroom- a school garden, nearby forest, or creek and seeks to develop a relationship between the students and the community. Educators often combine multiple subjects, for example, science, math, and language arts, into the curricula. PBE provides a unique learning experience, one that involves the student, community members and the natural world.

Sobel (2005) also reported:

PBE takes us back to basics, but in a broader and more inclusive fashion. Desirable environmental education or what we're calling PBE, teaches about both the natural and built environments. The history, folk culture, social problems, economics, and aesthetics of the community and its environment are all on the agenda. In fact, one of the core objectives is to look at how landscape, community infrastructure, watersheds, and cultural traditions all interact and shape each other. (p. 9)

PBE typically consists of cross-curricular, hands-on project-based learning that involves the surrounding community. Traditional classroom textbook learning is replaced with real life experiences. Learning about the local fauna, for example the local birds, and inviting the community to assist, is considered classic PBE.

The Center for Place-based Learning and Community Engagement (see Appendix) provides principles for successful PBE. However, it is important to remember that PBE is an ongoing process that can be refined along the way, thus the principles are only a helpful starting point. The following principles are from Promise of Place, website of The Center for Place-based Learning and Community Engagement:

Principles of Successful Place-based Education

1. Learning takes place on-site in the schoolyard, and in the local community and environment.
2. Learning focuses on local themes, systems, and content.
3. Learning is personally relevant to the learner.
4. Learning experiences contribute to the community's vitality and environment quality and support the community's role in fostering global environmental quality.

5. Learning is supported by strong and varied partnerships with local organizations, agencies, businesses, and government.
 6. Learning is interdisciplinary.
 7. Learning experiences are tailored to the local audience.
 8. Learning is grounded in and supports the development of a love for one's place.
 9. Local learning serves as the foundation for understanding and participating appropriately in regional and global issues.
 10. Place-based education programs are integral to achieving other institutional goals.
- (retrieved February 22, 2009)

Assumptions

Students are often taught about esoteric global science concepts. I assume this occurs for a host of reasons including, but not limited to, the use of mass-produced textbooks, and the lack of time, resources, and knowledge to develop curricula based on the local community.

Although the textbooks are aligned to the California State Science Standards, they are often produced for a general audience; therefore the content tends to be more general and broad, instead of site specific. Most of the textbooks teachers are issued target exotic species and faraway places.

I believe another contributing factor is that public school teachers in California do not have the time or resources to create new, or tailor existing, curriculum dedicated to the natural history of their community. Additionally, I think many teachers lack science knowledge and training. For those reasons, most teachers rely on the ambiguous textbooks and curricula. Consequently, students are uninterested or unable to grasp the abstract material and teachers miss an opportunity to connect students with tangible resources and hands-on learning accessible in the schoolyard or greater school community.

PBE provides teachers with an opportunity to invigorate their students by connecting science content and hands-on projects with the local natural world within their community. I believe real world experiences spawn a great interest for science and learning, decrease classroom behavior problems, and create a life-long commitment to one's community and the Earth.

Background and Need

Although the term "Place-based Education" was not used during the 18th Century, according to Streeter and Bowdoin (1997), learning and teaching about the flora and fauna within one's immediate surroundings dates back to at least to 1787, and possibly earlier (p. 10). Gilbert White, an 18th Century English naturalist is best known for *The Natural History and Antiquities of Selborne*- a compilation of letters from White to three fellows. The letters contained detailed descriptions of White's observations of local plants and animals, including birds and the people that lived within the community (Streeter and Bowdoin, 1997, p. 10). Streeter and Bowdoin state, "White's great contributions consist of three main categories: his observations of birds and bats, theories on migration, and the discovery of the harvest mouse as a new species" (p. 12). They stated, "White simply recorded his observations. This is relevant to children and education today because it is part of their heritage. When one discovers how the land works they can figure ways to make the future work" (Streeter and Bowdoin, 1997, p. 14).

Although the practice of PBE has occurred for centuries, the term was not coined until the early 1990s. It has since been further developed by the Orion Society, a non-profit organization based in Massachusetts in conjunction with David Sobel, the director of Teacher Certification Programs in the Department of Education and director of the Center of Place-based Education at Antioch University New England.

The Promise of Place website is a project of Center for Place-based Learning and Community Engagement (see Appendix). This unique public private partnership works to advance the state of the art in PBE by facilitating collaborative efforts in research, program design, technical assistance, resource development and dissemination, conducted third party studies to reveal the importance of PBE. They proclaim, “Current academic studies and program evaluations suggest that place-based education can invigorate educators, increase student interest in learning and comprehension, and foster a positive relationship between students, teachers, and the community” (Promise of Place, Why Place-Based Education Matters section, para. 2).

Promise of Place cites two studies, Liebermann and Hoody (1998) and Duffin and PEER Associates (2007), both of which have analyzed the advantages of PBE. Liebermann and Hoody (1998) conducted a study to analyze community involvement and outdoor immersion. The research suggests PBE generates a heightened engagement of the senses, reduced classroom problems, inquiry-based questioning, and increased engagement and enthusiasm for learning. The study involved forty schools in 12 states that designed their entire school curricula and structure around using the local community and natural resources as the context for learning. Results showed that students in schools that used the Environment as an Integrating Context (EIC) were outperforming their peers from non-EIC schools. They found:

- Higher scores on standardized measures of academic achievement (reading, writing, math, science, social studies, GPA)
- In the 14 schools that compared EIC v. traditional programs, 36 out of 39 measures showed better performance by EIC students

- Reduced discipline, classroom management problems; Increased engagement and enthusiasm for learning; Greater pride, ownership, in their accomplishments
(retrieved February 26, 2007)

In a later study, Duffin and PEER Associates (2007) asserts PBE immerses students in local heritage, cultures, landscapes, opportunities and experiences, using these as a foundation for the study of language arts, mathematics, social studies, science, and other subjects across the curriculum. PBE emphasizes learning through participation in service projects for the local school and/or community. PBE addresses three integrated goals: A) improving student achievement; B) improving community social and economic vitality; and C) improving ecological integrity. They also site several years of evaluation findings, including four years of individual and cross-program evaluations of six PBE programs representing more than 75 schools (rural, suburban, and urban) in five states. The evidence suggests that PBE can invigorate educators, transform culture, help students learn, and can engage communities (Promise of Place, Research and Evaluation section, para. 4).

Although projects like The Center for Place-based Learning and Community Engagement report positive effects on educator enthusiasm, learning and student achievement, and strengthened relationships between student, teacher and community, there is a need for continued research and application of the PBE model.

CHAPTER 2 REVIEW OF THE LITERATURE

The purpose of this review is to provide background information about PBE, to provide natural history information about Marin County bird species, to determine if PBE exists in Marin County, and to locate and evaluate science curricula with regard to Marin County's bird species. Identifying and evaluating Marin County bird species science curricula will help determine if there is a sufficient amount, or lack of, curricula resources for teachers to teach a unit about the birds of Marin County. The long-term goal is to synthesize all curriculum and resources for easy access to Marin County teachers.

Place-Based Education

Sobel (2005) declares PBE is taking root in urban and rural, northern and southern, well-to-do and rough-around-the-edges schools and communities across the country (p. 1). A variety of research studies show this to be true.

A corollary to this is the study by Powers (2004) that analyzes the effects of four PBE programs on teachers, students, schools, and communities. Findings include a report from an aid of a 5th grade class who works with a boy with attention-deficit hyperactivity disorder. She said, "He is not well integrated with the class, but he thrives when they go outdoors to learn. He can do the math piece when it's applied, but not as part of the regular class learning" (p. 27). Another teacher reported that sustainability-related curriculum has "generated life from some kids that we've never seen...I see teams of kids doing stuff independently that they've never done." (p. 28).

Jamestown New York's Roger Tory Peterson Institute sparked a regional revival in K-12 nature studies, which attracted attention from educators across America. The Rural Trust Project began in 1993, under the auspices of "The Selborne Project". At its inception, the project requested teams of middle school teachers to explore one square kilometer surrounding a particular school. Participants enroll in a five-day summer workshop where

they work on their observation skills that they will impart on their students in intense interdisciplinary units, usually six to eight weeks long. The study takes at their immediate schoolyard and the surrounding land, with the goal of learning about the natural world and human systems, and how they interact (Null, 2001, p. 2).

In the late 1990s, the program name changed to “Teaming with Nature” and expanded to reach all grade levels. Curriculum has been designed by participating teachers and is available to educators who participate in the Institute’s programs. Children learn how to draw and identify local trees, and also practice drawing and identifying regional architecture. As they deepen their appreciation of the area’s natural surroundings, they also develop an appreciation for its architectural heritage, discovering that “newer” is not always “better”. The project spans science, math, and English- language arts. Students create and analyze surveys, use tools to measure the one square kilometer, write formal business letters, and develop social skills by interacting with business operators and government officials. They often give back to the community by engaging in community-service projects. (Null, 2001, p. 4).

And yet another fine example of place-based education in action is the Adopt-A-Trout program in Montana. Students in rural Montana schools were introduced to fisheries research with the Adopt-A-Trout educational program. The goal of the program was to enhance the understanding and conservation for native fish in the West. Schmetterling (2002) postulates the teachers found the program outstanding because it used a cross curricular approach by including math, science, geography, arts and technology (p. 10). Additionally, real life experiences helped students relate to the natural community of where they reside and gave them an appreciation of the uniqueness of the natural resources in the area.

A few schools that have adopted the pedagogy of PBE focus on birds. For example, the fifth grade class of Fairyland School in Look Mountain, Georgia studies the habitats and habits of Eastern Bluebirds during the entire school year. Grant and Yonts (2003) describe the skills acquired by the students during this PBE curriculum:

While centered on eastern bluebirds, this project helps students develop skills in many different curriculum areas. Natural history lessons conducted by the Tennessee Aquarium and Lula Lake Trust staff allow students to explore their local habitats. In social studies, a local historian provides the details of the importance of the area during the Civil War and to the Native Americans. Students use language arts to create their own legends surrounding the lake and area, and practice reading and research skills as they look for answers to their questions. Communication skills are developed as students record their observations in their journals, write letters to community businesses for support, and present the project to the upcoming fifth-grade students at the end of the year-verbally and visually with original artwork. Many aspects of the project build confidence in mathematic skills, particularly the construction and map-drawing phased. In science, students experience science “in-action” as an ornithologist demonstrates bird-banding techniques and explains the value of the information gained through these studies. Throughout the project, students use the scientific method and science-process skills. They hypothesize and experiment about the color, height, and direction of the [bluebird] houses. They observe, collect, and record data about the location and occupancy of the houses. They measure the sites and the height of the houses and record the findings on maps

and in their journals. They communicate with their group members and the other groups. (p. 23)

Another example is a preschool that incorporates many hands-on activities focusing on birds during their nature studies unit. Russo (2008) asserts any teacher anywhere can accomplish an in-depth study of birds. In this study, preschool teachers begin a bird study by taking bird watching walks in their neighborhood. They bring digital cameras and take photos of birds, nests and bird feeders. Equipped with field guides and bird books, they visit the same trees and bird feeders regularly and practice learning to identify the birds they see. Revisiting the same places several times test and expands children's observations skills (p. 27).

Middle school students work with the local Audubon Society chapter during a PBE unit focused on National Audubon Society's Puffin Project. Fore (2005), explains that in late winter the curriculum shifts from the environment to birds and mammals. The middle school teacher points out that with the assistance of the local Audubon Society chapter and after researching indigenous species, the Atlantic puffin was chosen as an introduction and main theme of study. In the beginning of the unit, students research historical information regarding the drastic decline of the Atlantic puffin during the 1880s. Interdisciplinary connections are made with drawings or sculptures in art, fiction or non-fiction writing, and estimating population projections in math class (p. 59).

The local Audubon chapter visits the students and initiates an interactive game called the Puffin's Journey. Challenges, including human impacts, puffins face during their first three years of life are highlighted. Following this activity, students design fundraising activities to adopt a puffin. Audubon updates the students about the status of the adopted puffin. Additional money is raised for an end-of-the-year trip to visit the islands to see the restored puffins. As the students move through the grades, they often recall how the puffin

trip was a highlight. The obstacles the puffins overcome are often an inspiration for students to move beyond the hurdles they face in their own lives. The Project Puffin is a program of National Audubon Society and began in 1973 (p. 59).

PBE is a creative and dynamic way of teaching and learning science. It is easy to incorporate many strands like math and language arts into PBE science curriculum. Furthermore, the involvement of community members allows students to understand different views and illuminates real life careers.

CHAPTER 3 MARIN COUNTY BIRD SPECIES INFORMATION AND RESOURCES

Marin County is host to 490 species of birds. Some species are year-round residents, while others are migratory. The Pacific Flyway, extending from Alaska to Patagonia, is a major north-south route of travel for migratory birds in the Americas. Every year, migratory birds travel some or all of this distance both in spring and in fall. They migrate for food sources, to breeding grounds, or to overwintering sites. Point Reyes National Seashore, located in Marin County and the San Francisco Bay are key resting places for birds of many species. Thousands, and sometimes millions, of birds gather to feed before continuing their journey. Some species stop for a few days before continuing and some stay the entire season. The 490 species of birds can be classified into three groups: resident birds, winter birds, and summer birds. A resident bird is a bird that does not make seasonal migrations.

Educators wishing to teach a bird unit and want to learn how to identify some of the common birds in Marin County can easily begin by becoming familiar with the following organizations and products. The websites of two organizations offer a checklist of birds. The first checklist entails birds that live and visit Marin County is found on the Marin Audubon Society website (see Appendix). The other website offers checklists featuring California birds from different parts of the state and can be found on the website of the United States Geologic Survey (USGS), (see Appendix).

Numerous books and other bird-related items are available for purchase on-line through the following companies: the American Birding Association (see Appendix) and Acorn Naturalist (see Appendix). *Local Birds of Marin County* field guide is laminated, lightweight, double-sided, and folds into a small compact booklet. Its durability is attractive and it is easy to use with students in the classroom and out in the field. This guide is inexpensive and is sold in most local garden shops and bookstores. Lastly, eNature website (see Appendix) offers user-friendly on-line field guides.

Quite a few local organizations offer free bird watching outings in Marin County and the Bay Area. For instance, Marin County Open Space District (see Appendix), Marin Audubon Society and PRBO (Point Reyes Bird Observatory) (see Appendix), offer half, full and weekend bird watching trips. The San Francisco Bay Flyway Festival (see Appendix) is a bird festival held annually in Marin County each February. Open to the public, it provides a wide variety of resources and features guided hikes, outings, workshops, and vendors. Marin Nature Adventures (MNA) (see Appendix) and Point Reyes Field Seminars (see Appendix) provide guided bird watching outings for schools and families, at a reasonable rate. Educators seeking professional development can contact both MNA and PRNS.

Furthermore, three websites make available information about birds and the sport of birdwatching. The first is Birdwatching Dot Com (see Appendix). This website includes a host of items from birding FAQ and tips to a free e-newsletter and store. The office and online store reside in Fairfield, Iowa and are owned and operated by a couple, Diane and Michael Porter. The second is the Neotropical Migrant Birds (see Appendix) website which offers information about neotropical migratory birds, why they are threatened, conservation, and helpful resources such as a field guide, slide show and quiz. Lastly, The Owl Pages (see Appendix) imparts information regarding owls including audio calls, photos, and range maps.

Many resources are available with regard to the natural history of Marin County birds. Although the world of birds may seem daunting it is rather simple to get started. With field guides and binoculars in hand, all one needs to do is bring the children outdoors. Looking for birds and trying to identify the different species is challenging and most children will be hooked from day one. The bird unit can evolve as the students' engagement and enthusiasm grows.

Place-based Education in Marin County

PBE took root in Marin County during the 1960s. A pioneer in the field of PBE, Mrs. Terwilliger, or ‘Mrs. T’ as she was fondly known, taught hundreds of children and their parents about the nature around them during nature walks. The very descriptive prose of Terwilliger (1976), leads the reader on a nature walk across the land of Marin for a year beginning in January and ending in December. Terwilliger’s most famous words were: “teach children to love nature; people take care of what they love”. In an article published by WildCare News (“WildCare Remembers Mrs. T”, 2007), Terwilliger’s teaching style is explained, “her approach, now known as the Terwilliger Teaching Method is characterized by multi-sensory interactive engagement with nature that allows students to discover it from the outside in, and at the same time, from the inside out. Using her method, a student can learn from all his/her senses sight, sound, smell, touch, and taste. What each student learns directly through the senses is truly learned” (p. 4). Her legacy lives on at WildCare (see Appendix) as they continue to provide Marin County students’ multi-sensory experiences in nature by offering fieldtrips to local schools.

Marin County gained a strong leader in the field of PBE in the 1990s when the Bay Institute gave rise to a new program: “The Students and Teachers Restoring a Watershed Project (STRAW)” (see Appendix). The STRAW Project is a collaboration of students, teachers, community members and restoration specialists that work together to plan and implement watershed studies and restoration projects in Marin and Sonoma counties. STRAW promotes an educational approach known as “project-based learning”, in which students are encouraged to pursue their questions and develop projects focused on real-world issues (The Bay Institute Watershed Education, Empower Students, para. 1). Scientific, educational and technical resources are provided for students and teachers. Classes participate in hands-on, outdoor watershed studies and restoration projects on ranches, farms,

school grounds and other public lands. Native planting and erosion control projects are typical projects students carry out.

Missy Wipf is the Education Coordinator for PRBO. An interview with M. Wipf, (personal communication, March 24, 2008) revealed educators are welcome to join STRAW by participating in the annual three-day teacher-training institute, *Watershed Week* in early August before the school year begins. Approximately 80-100 educators, community partners, and education providers gather to learn about integrating fieldwork with classroom curricula. The local ecology is highlighted and hands-on scientific inquiry approaches are studied. In 2000, the STRAW Bird Program was born (M. Wipf, March 24, 2008). The Bay Institute's website states:

Biologists and educators from PRBO Conservation Science began the STRAW Bird Program in 2000 to provide classroom and field educational activities and studies focused on native birds. In particular, they help students and teachers understand the importance of local riparian habitat for songbirds, especially declining populations of neotropical migrants. (The Bay Institute Watershed Education, Restore the Environment section, para. 3)

M. Wipf stated:

The STRAW Bird Project is funded by grants written by PRBO and The Bay Institute. After learning about the STRAW Bird program during the three-day *Watershed Week* teacher training institute, teachers can sign up to work with PRBO throughout the school year- free of charge, however they are not required to do so. (personal communication, March 24, 2008)

The STRAW Bird program is flexible, but generally follows a typical sequence. Typically the program begins with a visit from PRBO educators usually visit the classroom in the fall and conduct an ornithology activity where the students observe and sketch stuffed

birds (personal communication, March 24, 2008). M. Wipf stated that the ornithology activity is popular, especially with teachers of 3rd-6th grades, because it meets particular state science standards like adaptations and investigations” (personal communication, March 24, 2008). PRBO educators lead outdoor activities during the second visit. The students watch birds with binoculars and learn how to use field guides (M. Wipf, personal communication, March 24, 2008).

M. Wipf described the second visit as “a nice tie to the first visit because the students learned how to observe birds and also that birds are indicators of ecosystem health. We introduce the idea of monitoring birds and sometimes the students even participate in a mock bird study” (personal communication, March 24, 2008).

The class is visited again in the spring, this time PRBO educators often conduct a nest activity that often ties in with the restoration project they worked on during the winter. According to Wipf, “The culminating and most popular activity is when the students visit a field station and observe mist netting. Teachers can choose which field station to visit because PRBO has several through the county” (M. Wipf, personal communication, March 24, 2008).

CHAPTER 4 BIRD CURRICULUM: MARIN COUNTY PLACE-BASED EDUCATORS

Laura Honda is an esteemed fourth grade teacher at Manor Elementary School in Fairfax, California. She teaches PBE by engaging her students in a yearlong bird study. L. Honda is a member of the STRAW Bird program; therefore her students study local birds, ones they might see gathering seeds from one of the many birdfeeders she has hung outside the classroom windows (L. Honda, personal communication, March 2008).

The bird study kicks off in September when her students choose their “life bird” from the *Local Birds of Marin County* field guide. According to Honda, “they fall in love with their bird; they really do, especially when they see it for their first time eating from the feeders or when we are on a nature walk with binoculars” (personal communication, March, 2008). Honda has been a naturalist her entire life. She brings her enthusiasm for the natural world into the classroom and she brings her students out into the natural world. They learn about their *life bird* through research, hands-on activities, bird walks, investigations and community service. “My students are given a 181 page bound book filled with bird-related pages for journaling, sketching, reading and recording” (L. Honda, personal communication, March 2008). Her students get to know the local birds, especially their “life bird” by learning about the natural history and by watching them at the feeders and during birding outings.

Throughout the year they observe birds at the bird feeders, in the garden and at the swallow garden, along the nature trail at the school, and during their field trip to Lake Lagunitas. Many students also observe the birds at home in their own backyard. Students investigate questions that arise from the study such as “Which birds are attracted to which seed?” and they often share their excitement about birds with their families when school is not in session. Through the STRAW Bird program, PRBO educators visit the class several times a year and lead bird-related education activities for the students. Each year the study culminates with a community service project. The class creates a bird quilt, auctions it and

donates the proceeds to a local organization to help birds (L. Honda, personal communication, March 2008).

L. Honda has been incorporating local birds into her curriculum for years. She believes there is adequate natural history information and bird curriculum to get started. She acquires most of her curriculum from the Cornell Lab of Ornithology (see Appendix) and PRBO (personal communication, March 2008). Cornell offers a variety of K-12 educational materials for educators. Although most of their information pertains to eastern birds, teachers can find information about some birds that live in Marin County. PRBO offers educational materials for educators on-line and also works directly with teachers that are members of STRAW. L. Honda's advice to teachers, "Join STRAW! And take advantage of the resources offered through the various organizations like Hungry Owl Project (see Appendix) and Richardson Bay Audubon Center & Sanctuary (see Appendix)" (personal communication, March 2008).

She also stated materials are often expensive; therefore she depends on grants to fuel expensive resources for her bird unit. She has received money from Marin Municipal Water District (MMWD) and Marin County Stormwater Pollution Prevention Program (MCSTOPPP) (L. Honda, personal communication, March 2008).

Wendy Dreskin, is a Place-based Educator that enjoys sharing her knowledge and joy of nature, especially plants, with teachers and students throughout Marin County. A devoted naturalist, she is serious about teaching children about the flora and fauna they find in their backyards. According to W. Dreskin:

California State Standards are just that, statewide. They don't allow for wiggle room. For instance, Kindergarten growth cycles are often taught in autumn. Teachers and students sometimes raise native caterpillars that hatch in November. Unfortunately,

they release them at this time too and they end of starving to death because it is winter.

(personal communication, February 2007)

For years, W. Dreskin has noticed that the majority of teachers follow a north east coast seasonal calendar when teaching about nature. She mentioned her dissatisfaction about the phrase “*April Showers Bring May Flowers*” commonly hung on the walls of the classroom during the month of April. “This is not indicative of Marin County’s seasons. Our wildflowers begin to sprout in January because that is when it rains here” (personal communication, February 2007).

A credentialed teacher, Dreskin is active in many Marin County schools. She has created two programs available for teachers and students. The Junior Botanist Program is available for grades K-8. This program introduces students to native trees, ferns, flowers and grasses. Dreskin visits each classroom twice, the first time to introduce the program to the students, the second to test their new knowledge. The Junior Botanist program can be found on WildCare’s website (see Appendix).

A newly launched program similar to Jr. Botanists is the Junior Birdwatcher program, found on Marin Audubon Society’s website (see Appendix). Students, grades K-5, access information and photos of birds for their grade level. After completing and submitting the pretest they are invited to Richardson Bay Audubon Center and Sanctuary (see Appendix) to take a final and official test. If they pass they receive a certificate and begin the next grade level. Aside from a tool for students, teachers can benefit by using this program to learn about the local birds of Marin County.

Bird Curriculum: Marin County Organizations

A few organizations in Marin offer numerous bird-based educational programs and materials at a nominal fee. For instance, the STRAW Bird Project assists and encourages teachers and students to learn about the local birds in their schoolyard and neighborhood.

Educators from PRBO visit classes involved with the project and conduct hands-on inquiry activities that include observing, sketching, and investigations. Some classes visit one of PRBO field stations and watch mist-netting and bird banding- scientists at work. The *Junior Observer* is a publication created for the teachers and students working with the STRAW Bird project. It is created and distributed at the end of the year by PRBO Conservation Science and encompasses student artwork, poems, questions and stories about birds. Teachers can augment the activities of STRAW Bird by obtaining free bird curricula from the website of PRBO. PRBO (see Appendix) also offers the following bird programs for educators of grades 1st – 12:

- STRAW (Students and Teachers Restoring a Watershed) Bird Program
- Field trips to the Palomarin Field Station and Bird Banding Laboratory
- Resources for educators- teaching tools and curriculum
- Canal Community Program
- S.E.A. (Seabird Education Awareness) Alcatraz

Richardson Bay Audubon Center and Sanctuary (see Appendix) in Tiburon is open to the public year round and offers bird-themed field trips for grades K-3: *Audubon's Birds*. In addition to on-site programs they offer classroom resources including: *Audubon in the Classroom*, *Schoolyard Birding*, and *Poetry and Art in Nature*. *Audubon in the Classroom* consists of in-depth nature exploration and is available to prepare students for their visit or for continued exploration back at school following a visit. *Schoolyard Birding* fosters observation skills and contributes real data to science.

Students observe birds in nature, practice the scientific method, and learn about natural history. The *Poetry and Art in Nature* program allows students spend time outdoors creating art to share with the community. Audubon also loans out *Classroom Kits* for Pre-k to third grade teachers. Each kit contains real animal grade appropriate activities; real animal

artifacts, student workbooks, and equipment for outdoor exploration that helps bring science and natural history to life.

Nature kits, nature van visits, teacher resources (posters, coloring book, and nature guide), fieldtrips to local open spaces, and tours of their facility are the many resources offered by WildCare (see Appendix). Located in central San Rafael, WildCare is an excellent resource for teachers of grades K-6.

Meanwhile, Audubon Canyon Ranch Preserve (see Appendix) is situated across the street from Bolinas Lagoon. Field trips for grades 4 and 5 are offered during the school year. It is open to the public only during the heron and egret nesting season, April-June. Lastly, Marin Nature Adventures (see Appendix), offers naturalist-led bird watching opportunities and beginning bird watching programs for schools and the general public.

Bird Curriculum: Sonoma and San Francisco Counties

For educators living in Sonoma County but teaching in Marin, the Madrone Audubon Society (see Appendix) is a convenient resource. The home page has a link to Pee Wee Audubon, which opens to the Junior Audubon page. Environmental Education Resource Kits are available for teachers. They are free but a deposit is required and they need to be picked up in person. The following kits focus on birds:

- Birdhouses and Nestbox Kit (Grades K – 12)
- Birds and Habitats Study Kit (K – 12)
- Owl Kit (K – 12)

The California Academy of Sciences (see Appendix) offers PBE resources on their website. The Teacher page offers several resources, including classroom kits. Classroom kits for ages 4-6 are located at “Perfect for Preschool”. These “Junior Kits”, are rentable suitcases filled with craft activities, puppets, touchable specimens and worksheets. Each kit incorporates circle time, outside time, science, math, arts and crafts, and cooking. Educators

may borrow a kit for up to three weeks. Two of the seven kits pertain to birds, most of which are local birds of Marin County: Busy Birds I Jr. and Busy Birds II Jr. Busy Bird I Jr. features the crow, robin, gull, finch, dove, and hummingbird. Busy Birds II Jr. features the pigeon, starling, hawk, jay, sparrow, and blackbird. Specific tools found in the kit are a dozen pairs of binoculars, story book, a real nest and a plush bird.

The Owl Pellet Kit is available for grades 2-8, for a fee and the teacher must attend a workshop. The kit contains a poster, two videos on the natural history of owls, one mounted owl specimen, several books, and a new educational board game. Student worksheets in Chinese, English, and Spanish are included. Owl pellets and Petri dishes are also available for a nominal fee.

Bird Curriculum: National Organizations

A multitude of organizations distribute online bird resources. Projects and kits for the classroom and schoolyard, on-line activities for students and workshops for teachers are a few of the items made available. Most of the curriculum can be implemented immediately; however some of it pertains to eastern birds therefore teachers need to be aware and tailor the lessons to the local fauna.

The Bird Education Network (BEN) is an initiative of the Council for Environmental Education (CEE). BEN provides educators working in the field of bird conservation with a variety of new tools and strategies they can employ to be more effective. The network allows for the efficient information exchange of strategies, materials, resources and programs related to birds. In 2007, BEN organized the first, and very successful, National Gathering: Bird Conservation through Education. A second conference was held in February 2009. The conferences and listserv are free to anyone interested in bird education and conservation efforts.

A similar organization is the Bird Education Alliance for Conservation (BEAC).

BEAC is a coalition of educators representing universities, bird observatories, local, state, and federal agencies, and environmental education and conservation groups. BEAC does not supply curriculum or links to obtain curriculum on the website. However, teachers and students along with wildlife managers, interpreters, and biologists are encouraged to join the listserv, a committee, or both. The listserv is a communication tool used to share bird conservation education, news, upcoming meetings and conferences and more.

Partners in Flight was launched in 1990 and comprises of partnerships among federal, state and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. The mission of this consortium is to help bird species at risk, keep common birds common, and to create and nurture voluntary partnerships for birds, habitats and people.

This user-friendly database provides teachers with websites about birds and contains enough information to teach about birds for a day, week, month or year. On the “Education Resources” page, the following five organizations and websites are listed: International Migratory Bird Day, Environment for the Americas, BirdIQ, Avian Index, Flying Wild, Cornell Lab of Ornithology, and Smithsonian Migratory Bird Center.

International Migratory Bird Day (IMBD) (see Appendix) is a time to recognize the amazing journey of migratory birds. Celebrations include bird festivals, walks and educational programs and occur in the U.S., Canada, Mexico, and Central America. In the U.S. it officially takes place on the second Saturday in May but in the Southern Hemisphere it usually occurs during autumn. IMBD was spearheaded by the Smithsonian Migratory Bird Center, in the early 1990s. It grew rapidly spanning country borders gaining international recognition and support. The National Fish and Wildlife Foundation and U.S. Fish and Wildlife Service governed the program from 1995-2006. Because of its growth, the

Environment for the Americas (EFTA) sought leadership of IMBD and it is now their premier education project. EFTA is a non-profit organization working to increase awareness of birds and their conservation throughout the Western Hemisphere.

Each year IMBD focuses on a different bird conservation theme and provides corresponding educational materials to match. Educators wishing to involve their students by participating in IMBD can incorporate materials into lessons or host a festival at their school or community. Information regarding registration and ordering of materials can be found on the EFTA website.

BirdIQ (see Appendix) is a bird conservation partnership between ConocoPhillips and the National Fish and Wildlife Foundation. The website states, “The BirdIQ website is one-stop shopping for information and educational material about birds”. A highlight of the website is the “Avian Index”. This helpful tool provides summaries of bird-related organizations, programs, websites, and information pertaining to specific featured items, for example, a bird storybook.

Flying WILD (see Appendix), a program of the Council for Environmental Education offers a curriculum guide, *Flying WILD: An Educator’s Guide to Celebrating Birds* for teachers after they complete a Flying WILD Educator Training. According to the website, the training is described as “Educators receive a minimum 3-hour workshop that is fun-filled and interactive, with hands-on experiences in conducting activities and implementing the Flying WILD program. The training is ideal for teachers, environmental educators, school administrators, after-school program staff, and youth group/service organization leaders. Flying WILD was created to engage middle school students, especially urban youth, about migratory birds and to promote and inspire environmental learning and stewardship”.

The Flying WILD Educator Training can be adopted by educators of all grades.

Participants can glean relevant information and activities and adapting them to suit the specific grade level.

The Cornell Lab of Ornithology Educator's Guide to Bird Study (see Appendix), comprises activities and resources helpful in learning about birds and contributing to inquiry-based research. One noteworthy activity is the Great Backyard Bird Count (GBBC), sponsored by the Cornell Lab of Ornithology and the National Audubon Society. The GBBC is an annual four-day event that provides an opportunity for students to observe, count and tally the highest number of birds of each species seen together at any one time and report their counts online. Participants can track the counts throughout the country by using the internet and they can see how this year's numbers compare with those from previous years. A very flexible program, participants need to count for at least 15 minutes at anytime during the day for the four days in February of each year declared by GBBC officials.

Winging Northward (see Appendix) website offers a program called "Shorebird Sister Schools". This program is designed to help students track migration of shorebirds and to share their experiences with other "sister schools" around the world.

A handy book by Humes (2007) contains a great deal of information about the world of birds and can be found at the local library. For novice bird watchers and educators, it could provide a starting point for learning about birds and how to record observations. The first half of the book introduces birds to the reader by describing the life of a bird and how to be a bird watcher. The section following contains a mini-field guide with colorful illustrations of the most common Eastern birds and a 52-week logbook designed to help the reader keep track of bird observations.

Federal Junior Duck Stamp Program (see Appendix) is an educational program designed to bring awareness to students about the importance of wetlands and waterfowl. A

66 page curriculum guide containing lessons for all school ages is available for download.

Additional educational resources, including web cams and links to various bird-related organizations, are available on the educator's page.

The Alaska Bird Observatory (ABO) (see Appendix) presents on-line resources. The "Boreal Forest Songbirds of Alaska" teaching unit consists of eighteen lessons focused on songbirds of the Boreal Forests. The "Songbird Activity Book" is designed for teachers to use in the classroom before visiting the observatory. It contains coloring and activity pages, and natural history information.

Science Netlinks (see Appendix) provides standards-based resources for K – 12 science educators. The "Lessons" page includes numerous lessons including bird-themed lessons such as "Hatching Chickens", "Bird Beaks" and "Birds of Prey".

Virtual field trips in the classroom are gaining popularity. Grand Teton's Birds of Prey: Awesome Winged Predators eFieldtrip (see Appendix) is a free virtual field trip provided by Grand Teton National Park. Educators simply register their class and print an eFieldtrip journal for each student. Students experience a virtual visit and have the opportunity to ask experts questions.

Although the focus of this study focuses on land birds, it is pertinent to include curricula resources pertaining to seabirds. Web Under Waves: Exploring Coastal Marine Life (see Appendix) is a free on-line resource sponsored by the U.S. Fish & Wildlife Service San Francisco Bay NWR Complex. The website offers free activities for grades 3 –5. Included among the many activities are student and teacher journals, seabird adaptation card game, and a monthly newsletter for students. PRBO has a common murre trunk for loan to educators. It contains educational resources including posters, videos, and various other items (M. Wipf, March 24, 2008).

In addition, the subsequent organizations offer free online seabird curricula available:

NOAA's National Marine Sanctuaries, Cordell Bank National Marine Sanctuary, Oikonos, and the Surfrider Foundation (see Appendix).

Bird Curriculum: Academic Research

The work of Burns (1994) was created during a workshop by teachers dedicated to improving the quality of education, especially of math and science. The goal was to create lesson plans that did not require costly materials and an extensive background in science for the teacher. The activities introduce students to the process skills of natural science while learning about birds and their role in the community. An appreciation for living creatures and respect for the property of others can also be learned from these activities (pg. 1). Because this unit is very basic and uncomplicated it is ideal for a teacher that is interested in teaching a unit about birds but doesn't know where to begin.

Jackson (1996) infuses technology awareness and study with science, math, language arts, art, and social studies by exploring the world of birds through hands-on activities. Jackson states "technology instruction does not just qualify as computer instruction but teaching students to understand how and why product are made and used" (p. 12). A creative cross-curricular approach to teaching technology, the students learn to use binoculars, build bird feeders, experiment with different seeds, graph results and hatch chicken eggs, among other things.

Russo (2008) describes a bird study developed for preschool aged children, however, the model can be adapted for elementary age children. Some highlights of the bird study include, direct observation time outdoors with neighborhood bird walks to see, hear and snap photos of birds. The class "adopts" trees and bird baths and repeatedly visits them in hope to see a bird. The teachers introduce the children to recordings of birds, field guides, and real birds' nests. Also part of the bird unit is the incubation and hatching of chicken eggs

Russo (2008) explains:

“A deep study of birds is easy to implement and lets children experience the natural world authentically. In addition to observations and in-depth discussions, stories and art activities allow children to role-play and become birds themselves and then reflect on their experiences. In fact, the whole classroom can be transformed into a bird sanctuary”. (p. 26)

Furthermore, storytelling and dramatic play are incorporated into the curriculum during story time and while visiting with a professional storyteller and visual artist. Children have opportunities to reflect on their learning by drawing, writing and creating. For example, they create books directly after story time build nests out of the same materials birds use and construct one big tree house to be enjoyed by all. “The key is to provide authentic experiences in which children gain firsthand knowledge of birds.” (p. 30)

In conclusion Russo explains:

The combination of observation, dramatic play and storytelling, and reflection through art making helps children achieve levels of understanding that are impossible when working only with words and images in books. Hands-on activities are outlined in the article including key information about how to attract birds to your school yard, what to do on a hike, tips for dramatic play and storytelling, a list of books, how (and what) to talk about birds, questions that invite exploration and a list of resources. (p. 30)

The work of Silverman (2007) connects music and science through studying birdcalls and songs. For elementary students with varying interests and abilities in science and music, studying birdsong through music can expand knowledge, teach new skills, and integrate learning across varying disciplines (p. 20). The three lesson plans provided are connected to the art and music standards and also the National Science Education Standards and are for grades Kindergarten through eighth grade. However, the lessons were put into action in a

third / fourth grade classroom (pg. 20). A wide variety of songsters are found in the most urban settings- starlings, house sparrows, crows, jays, robins, cardinals, blackbirds, and doves- and consciousness of nearby wildlife is the first step to a greater appreciation of the natural world (pg. 25).

Academic research, in search of PBE bird curricula, uncovered a few excellent resources. It is quite possible the new database *Flying Wild* is creating will increase the number of new and innovative PBE bird curricula available to educators.

CHAPTER 5 DISCUSSION

Summary of Major Findings

The literature suggests that the pedagogy of PBE excites the learner, rejuvenates the teacher, and emphasizes the value of partnerships between schools and the local community. PBE is gaining popularity among educators wishing to focus on a multidisciplinary approach to teaching by providing students with real world experiences. Research demonstrates the importance of PBE in relation to academic achievement and community building.

PBE is accessible for Marin County educators. The Bay Institute's STRAW Bird program is a fine example of PBE in action. STRAW Bird provides curriculum materials for educators and hands-on learning experiences for student-community interface. The goal of the STRAW Bird program is to raise student awareness about the importance of healthy bird habitat through hands-on restoration efforts with local landowners.

At least two other successful PBE models currently exist within the county. The first is Marin Country Day School's first grade Bird Study; the other is Manor School's fourth grade yearlong bird study. Several Marin County organizations including WildCare, Hungry Owl Project and the Richardson Bay Audubon Sanctuary supply relevant resources that enhance bird curricula. PRBO and Cornell Lab of Ornithology provide free online bird curricula. Utilizing these resources is paramount to implementing a successful PBE program.

Limitations/Gaps in the Literature

Significant research, like that of Sobel (2005), has been conducted and documents the positive effects of PBE. However, there is limited PBE research focusing specifically on local bird lessons and their educational effects on the learner. Further experimentation should be conducted in order to test the benefits of PBE in regard to birds as a study subject. My experience and intuition has shown a very promising link between local PBE bird curricula and inspired learning. Additionally, there is a paucity of Marin County bird curricula thus

making the task of procuring particular lessons awfully time consuming for the modern day public school teacher.

Implications for Future Research

There are two areas in great need of future research in regard to PBE science curricula and Marin County birds. The first area to investigate is the textbook development process. Specifically, how are people selected to be part of the textbook development process? What credentials do they possess? Since the pedagogy of PBE is gaining in popularity, it is prudent to have experienced PBE science educators on the textbook development committee. A second area to explore is to determine how the existing science curricula regarding Marin County birds meet the California State Science Standards. Most of the current available bird curricula do not inform the reader of how it meets the California State Science Standards. Curricula containing standards information is critical to the teacher who is typically pressed for time.

Albeit PBE focusing specifically on Marin County local birds is available, however, at this juncture it is very time consuming to locate natural history information and curricula resources on the subject of birds. Educators would benefit from having a place where all bird curricula resources were available, perhaps on a website, where information and resources could be easily accessed and downloaded. I would like to spearhead the development of a master curriculum guide designed to assist Marin County educators to get outdoors and teach their students about the region's birds. Access to an online resource and hard copy guide of such magnitude would help foster the ease of teaching outdoors, invigorate student learning, and build lifetime relationships between the school and greater community.

Overall Significance of the Literature

The literature supports the idea that PBE has galvanized traditional classroom teachers to redirect their energy by providing project-based learning that stimulates the creative juices

of the student. Positive outcomes such as increased student achievement and decreased classroom behavioral problems make PBE an attractive method of teaching. Engaging in learning activities in the natural world and actively participating in one's community fosters awareness, motivation, pride, and ownership.

Through previous research and my own observations I have learned that the real experience of watching a bird eating or preening couldn't be replaced with lessons from a textbook. Enthusiasm and interest in learning is especially acute when the concepts allow for visualization and manipulation of materials. This review indicates that children take charge of their education when real life experiences and connections are made. These experiences and connections motivate them to ask questions, uncover answers and invest in their education. PBE encapsulates this philosophy perfectly thus instituting a bird study is a fun and easy place to begin.

In conclusion, it is with great passion that I teach children about the wonderful world of birds. Teaching and learning in one's immediate environment is magical. And it is my desire for *all* children to have these rich learning experiences. It is the zeal I possess for both children and birds that fueled this research quest and it is what motivates me to act upon my idea of developing a master curricula guide for Marin County teachers.

Tell me, I will forget

Show me, I may remember

Involve me, and I will understand

~Chinese Proverb

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APPENDIX

Acorn Naturalist

www.acornnaturalist.com

A California company founded by two professional educators, it specializes in science and environmental educational resources.

Retrieved on February 4, 2008

Alaska Bird Observatory (ABO)

www.alaskabird.org/bfsunit/unit/introduction.html

Information and curricula regarding migratory birds of the Boreal Forest.

Retrieved December 9, 2008

American Birding Association

www.abasales.com

A non-profit organization dedicated to recreational bird watchers. The ABA Sales link offers many supplies for birdwatcher, including a national checklist of birds.

Retrieved on February 4, 2008

Audubon Canyon Ranch Preserve

www.egret.org

Field trips for grades 3-5 are available for educators. The preserve is only open to the public during the heron/egret nesting season, March-July- weekends/holidays.

Retrieved on April 21, 2008

Avian Index

www.birdiq.com/learn/Resource_Dir/index.php

Very thorough resource directory (websites, festivals, curricula, etc)

Retrieved December 9, 2008

Bird Education Alliance for Conservation (BEAC)

www.birdedalliance.org

BEAC promotes bird conservation through education. The listserv is a communication tool used to share bird conservation education, news, upcoming meetings and conferences.

Retrieved December 9, 2008

Bird Education Network (BEN)

www.birdeducation.org

An initiative of the CEE, BEN provides educators in the field of bird conservation with tools and strategies. List serve for anyone interested to join.

Retrieved December 9, 2008

Birdwatching Dot Com

www.birdwatching.com/index.html

Information about wild birds and the sport of birding. Subscribe to a bird e-newsletter.

Retrieved December 9, 2008

BirdIQ

www.birdiq.com

Information and educational materials about birds including virtual fieldtrips, videos and curricula.

Retrieved December 9, 2008

California Academy of Sciences

www.calacademy.org

Provide bird resource kits for loan, on-site field trips, and professional development

Retrieved December 9, 2008

Cornell Lab of Ornithology

www.birdsource.org

Resources include: bird coloring and informational sheets, Great Backyard Bird Count (GBBC), the Educator's Guide to Bird Study, eBird and Project Feeder Watch.

Retrieved on March 30, 2007

Cordell Bank National Marine Sanctuary

<http://cordellbank.noaa.gov/education/welcome.html>

Seabird resources

Retrieved December 9, 2008

Council for Environmental Education, CEE

<http://www.councilforee.org>

EE programs and resources, including "FlyingWILD".

Retrieved on April 21, 2008

eNature

www.enature.com

Information pertaining to wildlife of the United States, including on-line field guides.

Retrieved on February 4, 2008

Federal Junior Duck Stamp Program

www.fws.gov/juniorduck/EducationProgram.htm

Art curriculum highlighting wetlands and waterfowl conservation.

Retrieved December 9, 2008

Flying WILD

www.flyingwild.org

A program of the CEE, Flying WILD introduces students and educators to bird conservation via standards-based activities.

Retrieved on April 21, 2008

Grand Teton's Birds of Prey: Awesome Winged Predators eFieldtrips

www.efieldtrips.org/raptors

A free virtual field trip sponsored by Grand Teton National Park.

Retrieved December 9, 2008

Madrone Audubon Society

www.audubon.sonoma.net/pwee/pwedmat.html

Bird resource kits for loan.

Retrieved December 9, 2008

Marin Audubon Society

www.marinaudubon.org/sighting.htm#checklist

Free birding walks and programs. Marin County Birds checklist is available for purchase.

Retrieved on February 4, 2008

Marin County Open Space District

www.co.marin.ca.us/depts/PK/Main/mcosd/os_walks.asp

Free naturalist walks and talks are available throughout the year.

Retrieved on February 4, 2008

Marin Nature Adventures

www.marinnature.com

Naturalist-led educational bird watching fieldtrips.

Retrieved on February 4, 2008

Neotropical Birds

www.neotropicalbirds.org/index.html

Background information regarding neotropical birds.

Retrieved December 9, 2008

Partners in Flight

www.partnersinflight.org/education.cfm

Landbird conservation. "Educational Resources" page contains helpful links regarding birds.

Retrieved on April 21, 2008

PRBO (Point Reyes Bird Observatory)

www.prbo.org/cms/40

Online bird curriculum and resources. Information regarding STRAW Bird.

Retrieved on April 21, 2008

Point Reyes Field Seminars

www.ptreyes.org

Professional development opportunities to learn about Marin County birds.

Retrieved on March 9, 2009

NOAA's National Marine Sanctuaries

<http://sanctuaries.noaa.gov/education/teachers/welcome.html>

Seabird resources

Retrieved December 9, 2008

Oikonos

<http://www.oikonos.org/whatsnew.htm>
Seabird resources
Retrieved December 9, 2008

Promise of Place

www.promiseofplace.org
Center for Place-based Learning and Community Education website. Public, private and non-profit partnerships collaborate efforts in research and educational and community resources.
Retrieved on March 30, 2007

Richardson Bay Audubon Center and Sanctuary

www.tiburonaudubon.org
Bird-themed naturalist guided field trips and in-class programs.
Retrieved on April 21, 2008

San Francisco Bay Flyway Festival

www.sfbayflywayfestival.com
Annual bird festival- guided walks, workshops and supplies.
Retrieved on February 4, 2008

Science Netlinks

www.sciencenetlinks.com
Standards-based internet resources. The “Lessons” page offers a wide variety of age-appropriate lessons.
Retrieved December 9, 2008

The Bay Institute’s Students and Teachers Restoring a Watershed Project (STRAW)

http://www.bay.org/watershed_education.htm
The Bay Institute is dedicated to research, education and advocacy of the San Francisco Bay. The Institute’s STRAW project, is an example of Place-based Education because it coordinates students, teachers and community members to work together to restore watersheds.
Retrieved on April 21, 2008

Surfrider Foundation

<http://www.surfrider.org/whatwedo4.asp>
Seabird resources
Retrieved December 9, 2008

The Owl Pages

<http://www.owlpages.com/index.php>
Everything from an owl species list and owl vocalization recordings to owl mythology.
Retrieved December 9, 2008

United States Geologic Survey (USGS)

<http://www.npwrc.usgs.gov/resource/birds/chekbird/r1/6.htm>
Checklists of birds for various regions of California.
Retrieved on March 30, 2007

Web Under Waves: Exploring Coastal Marine Life

<http://www.fws.gov/SFBAYREFUGES/MURRE/education.htm>

Seabird resource sponsored by the U.S. Fish & Wildlife Service San Francisco Bay NWR Complex.

Retrieved December 9, 2008

WildCare

www.wildcaremarin.org

Numerous educational resources for educators including taxidermy bird kits for classroom use, fieldtrips, and on-site bird programs.

Retrieved on April 21, 2008

Winging Northward

<http://shorebirds.pwnet.org/index2.html>

Learn about migratory shorebirds in the classroom with this free virtual fieldtrip.

Retrieved December 9, 2008