

The Power of Water and Innovation Drives Culture Change of the Brandywine Valley

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Introduction

The world in which we live today has evolved more rapidly than ever conceived possible. Technology and the accessibility of information have allowed us to communicate and advance globally at speeds faster than ever before. Today, our students are able to access information and create national and international networks with minimal boundaries.

As we and technology progress, it is imperative that students understand and respect people, languages, and cultures within their own nation as well as other nations and countries around the world. This should also include appreciating the influencing factors of environment, climate, population, and agriculture, as they play an integral role in the evolution and advancement of societies. This historical appreciation brings insight to the political influences as well as technological advances, and how they affected past events and how they in turn affected the present.

Specifically, this unit will compare the culture and lifestyles of the Lenape Indians and the Europeans as they settled along the Brandywine River in the Brandywine Valley. We will also take a close look at the various ways they utilized the water of the Brandywine. Each population had a distinct culture and belief system that evolved over time. Both had good reasons for what they believed, but their actions had very different effects on the environment in which they lived.

It is my hope that this unit will bring greater awareness and understanding to the diversity of people and cultures in various places and regions around the world. As educators, we aim to prepare our students to be equipped with 21st century skills which includes; incorporating opportunities to develop a deeper appreciation of society's influencing factors there by equipping them to work together, to collaborate with mutual respect and tolerance across all borders. Ultimately, we would like our students to be cognoscente of these dynamics so as they begin creating a pathway into the future they will retain their strength of identity, character, civility, and aim for respect among all nations.

Audience

This unit is intended for a third grade classroom, but can be easily extended in depth and complexity for higher grades. Presently, I teach third-grade in a self-contained classroom at Brandywine Springs School, Wilmington, Delaware. The school has grades K-8 with a population of approximately 1,100 students. The population is comprised of 84.5% Caucasian, 5.3% Hispanic/Latino, 4.6% Asian, 3.5% African American, and 15.49% low-income. In the lower and intermediate grades there are on average 5-6 classes of each grade with 24-27 students in each.

Brandywine Springs School is situated in a suburban neighborhood in New Castle County, along the side of a county recreational park, with students coming to school each day from a variety of home circumstances and with differences in academic levels. As a result of these variables, the children have differing levels of background knowledge and life experiences. This unit is designed to engage and challenge each student at their individual level.

This unit will be particularly significant to our students since we are in such a historically rich area. They will be able to make connections between where they live today and how the people, technology, and cultures of generations past have carved and impacted their present world. Most importantly, the students will understand that they are the future designers and collaborators of tomorrow; making our future environmentally safe, eco-friendly, and culturally sensitive on a local as well as a global scale.

Background

The Brandywine Valley

The Brandywine Valley is well known for its lush beauty and meandering hillsides, rich with valleys for farming, forest for wildlife, and rivers and creeks that create harmony throughout the area. The Brandywine River is the major river that carves its way through the rolling hills of the Brandywine Valley in Southern Pennsylvania and Delaware. Historically, the valley's abundance of natural resources has served to make fruitful lives for both Indians and European settlers alike.

Initially, the Lenape, a tribe of the Algonquin Indians, settled in this area. They also expanded into areas known today as; New York, Southern New Jersey, Pennsylvania, and Northern Delaware. Later, Europeans, such as the Dutch, Swedes, English, and French, also settled in this area. In the beginning, the two cultures coexisted peacefully, but as time progressed they began to collide and ultimately, the majority of the Lenape population moved to Oklahoma and Canada. The Brandywine Valley was also the famous site of the Battle at the Brandywine, which resulted as a major turning point in the Revolutionary War. Today, we can still visit historical landmarks, experience the beautiful gardens, and see the innovations of the past in places such as; Winterthur,

Longwood Gardens, and Hagley Museum. The waterwheel technology that transformed the area from the 17th, to the 19th century is showcased at Hagley Museum, along with the numerous innovations that followed making the DuPont Company internationally acclaimed.

In this unit we will be taking a closer look at the Lenape and European cultures and how the Brandywine River was utilized and revered. The students will be asked to keep an open mind and understand the belief systems and reasoning that created the foundation of each culture and how it played a strong influence over their use of water. Both groups had a distinctly different approach; the Lenape viewed the water as a resource to sustain life, whereas the Europeans brought hundreds of years of experience of harnessing water's energy, which propelled machinery and sparked innovations as they continually designed new ways to meet the needs of their growing population.

How the Brandywine Got Its Name

There are many stories of how the Brandywine River got its name. The Lenape called it many names according to the location of their settlement; the "Wawaset", "Sittacunck" and "Tankopanican". This was probably due to the fact that the Brandywine changes as it flows to meet the Delaware River and ultimately the Delaware Bay. Swedish settlers called it the Fish Kill ("kill" meaning creek in Swedish) for the large amount of fish in the creek - particularly shad and alewives. But the origin of the name Brandywine has prominently two stories. Some say that the name came from a Dutch ship, The Brandywine, carrying strong Dutch spirits, and was grounded at the mouth of the Brandywine. While others, including most historians, believe the name was taken from a settler, Andreas Brainwende, who established one of the first grain mills along the lower river.

The Lenape Indians

The original inhabitants of the Brandywine Valley were an Algonquin Indian tribe who called themselves Lenape (Len-ah'-pay), meaning "common people". The tribe's traditional homelands included northern Delaware, eastern Pennsylvania, southern New Jersey and southeastern New York.¹ The Lenape were composed of 3 principal tribes: Munsee, or wolf clan; Unami, or turtle clan; and Unalachtigo, or turkey clan. Each tribe had its own territory and dialect, with separate identities yet shared cultural traditions. Eventually, the Lenape were renamed as the Delaware Indians and today the three clans are symbolized on the official flag of the Delaware Nation.²

Lenape Culture

For the Lenni Lenape Indians, the natural environment of the Brandywine offered the resources to satisfy their needs of food, shelter, protection, and travel for daily living. They were also known as the “Peace Makers” among the Algonquians as they helped other Indian tribes negotiate and settle differences in peaceful terms.³

Traditionally, the Lenape men were the leaders, built homes and canoes, hunted, fished, made tools (i.e. spears, arrowheads, fishing nets) prepared the land for farming, traded along the river, and protected the settlement. The women did the actual farming (known as the three sisters -- corn, squash and beans), made pottery and jewelry, as well as cared for the families. They were also the matriarchs of the settlement, which meant that the families were from the mother’s blood line. For example, the matriarch lived with her siblings (sisters) and families. When their young boys became 18 years of age, they were required to show their manhood through specific rituals. This signified their readiness to find a wife from another Lenape clan. During the marriage ceremony, the groom would offer a bone as a promise to provide and protect, and the bride would return the gift with an ear of corn as a promise to provide food and care for their family. The new couple would then live with the bride’s family clan.⁴

Housing

The Lenape lived in both wigwams and longhouses. The wigwams were oval-shaped, made from curved tree branches, and sealed with bark. The longhouses were long structures that provided a larger space for either meetings, a smoke house for cleansing rituals, or larger families. The Lenape settlements averaged two-to three dozen people, but were also known to expand to a peak of three hundred.⁵

Lenape Spirituality

Lenape spirituality is their way of life. It pervades and is a part of everything they do. Kishelēmùkòng created all things and his spirit lives in all things, thus all things are related and must be respected and honored. The People were given the Tèlèn òk nisha Lilenowòkànà (The 12 Laws) by Nanapush after he created the new world. These laws, or teachings, are the guidelines by which the People live their lives. The Lenape, and most all Native Americans, believe in one creator. Although different nations have different names for him, they nearly all recognize only one. The Lenape call their creator Kishelēmùkòng. They also believe in a number of Spirit Beings. They were created by Kishelēmùkòng to perform specific functions, and while they do have supernatural powers, they like the Christian saints or angels.⁶

The Four Spirit Beings of Creation: Rock, Fire, Wind, and Water

Kishelēmùkòng created four Spirit Beings to assist him in creating the world. He placed each of these Spirit beings at different directions of North, East, South, and West. Each had different powers and gifts to give us. These four Spirit Beings are highly respected and revered.

Muxumsa Lowanewank is the Grandfather of the North, spirit of the rock. He gave forth solidity. He gave us winter, ice, snow, cold, rocks, trees, our bodies, and all that we see around us.

Muxumsa Wapanewank is Grandfather of the East, spirit of the wind. He gave forth breath and mind. He gave us springtime, breath of life, birth, new beginnings, music, songs, and creativity.

Huma Shawanewank is Grandmother of the South, spirit of the power of fire. She gave forth spiritual life. She gives us summer, warmth, growth, passion, and energy to the sun.

Muxumsa Wunchenewank is Grandfather of the West, spirit of the water. He gave forth soothing influences. He gives us autumn, death, renewal, the waters, healing and cleansing, intuition, dreams and visions, emotions, and rain.⁷

The Arrival of the European Settlers in the 1700's

The Brandywine River and Valley attracted European settlers and played an important role in the development of the New World colonies, trade, and commerce. In 1609, the first to arrive was Henry Hudson, an Englishman, working for the Dutch East India Company. His ship, Half Moon, docked in the Delaware Bay and gave the Dutch the first claim to the area now known as Pennsylvania.

Soon the Swedish and Finnish adventurers arrived in 1638. They came in two ships; the Kalmar Nyckel (or "Key of Kalmar," a Swedish city) and the smaller Fogel Grip ("Bird Griffin"). Docking the ships at the mouth of the Brandywine, they built Fort Christina and Fort Trinity, in honor of their Swedish Queen Christina. These forts would become a stronghold and future lead trading posts. By 1643, the first Swedish settlement, Tinicum, was established. Swedes traveled up the Brandywine and encountered the Lenape. Peacefully, they established a mutually amenable fur-trading agreement.

Only a few years later, in 1655, the Dutch captured both Fort Christina and Fort Trinity and reclaimed the Swedish settlement. Although under Dutch rule, the Swedes were still able to continue their daily living without drastic changes, for example, they were able to keep their militia, religion, land, and courts.

As news traveled about the promise and riches of the Brandywine Valley, the English became interested. In 1664, King Charles II seized the possessions of the Dutch and renamed the area, from New Amsterdam to New York, in honor of his brother the Duke of York. Soon, King Charles II signed off a large parcel of land to William Penn, giving the region the new name of Pennsylvania. Penn arrived in 1682 aboard the ship, *Welcome*, and prominently set out to make a treaty with the Lenape. It is noted in Lenape records that they met by the Shackamaxon Elm, in the suburbs of Philadelphia. It was there that Tamemend, the chief of the Lenape (Delaware Indians) and Penn signed a treaty and exchanged wampum belts. Over time, William Penn became well known for his steadfast leadership and encouraged his fellow "Quaker" members of the Society of Friends to settle throughout the area. They established large farms, growing grain and raising cattle, some built mills along the creeks of the Brandywine to grind grain into meal and flour. A few of their mills and meeting houses can still be seen throughout the Valley – where their quiet, steady demeanor still remains a major influence today.⁸

European Expansion: Beginning of the Mill Industry in the 1800's

The mills not only processed grain and timber, they also manufactured paper and gunpowder.⁹ In Wilmington where the Brandywine met navigable tidewaters milling operations and inventions flourished. For example, the Conestoga wagon was designed to haul grain to water-powered mills on the swiftly falling Brandywine. (This wagon would later become the wagon that would lead the way during the Westward expansion.) Small ships could dock right at the mills, and grain carried by the ships or delivered by Conestoga wagon could be milled and then shipped directly (and cheaply) by water to other American ports and overseas. The large supply and high quality of the Brandywine flour set the international standard for the time, and the river's leading commercial role prospered.

In addition to the grain industry, the Brandywine Valley became America's paper milling center and the major supplier to the print shop of Benjamin Franklin in Philadelphia. By 1776, they began supplying the paper to print currency for the colonies and the Continental Congress and... The Declaration of Independence!¹⁰

Needless to say, the harnessing of water power for use in mill operations was a major factor in the area's population growth. The Europeans sought much more from the water resources than just its ability to sustain life on a daily basis as the Lenape. The water was the vehicle which provided the opportunity to produce a greater amount of product for an increasing population with less effort, leaving more people free to focus on other needs of the growing community.

Effects of European Expansion on the Lenape (Delaware) Indians

Meanwhile, around 1720, the Iroquois assumed dominion over the Lenape, forbidding them to make war or sales of lands, a condition which lasted until about the opening of the French and Indian war.¹¹ But despite the treaty with Penn and the Iroquois leadership, Europeans encroached and took over the Delaware hunting and growing lands, thus pushing out the Lenape. As a result, for almost a decade from 1735 to 1742, the Lenape tribes began to move westward into Oklahoma and Canada, with only a few families and individuals remaining.¹²

E.I. duPont de Nemours & Company

Historical development of the water wheel and its influence on the DuPont Company

“Man’s success in harnessing the forces of nature to supplement his own muscle power provides the framework for human history: first animals, then flowing water, the winds, steam, electricity, and now the atom. For two thousand years the water wheel in various forms was man’s chief source of mechanical power, and the science of mechanical engineering developed in the design and building of water mills. Water wheels were in use in ancient Persia and the Far East before the Christian era. The earliest description of a mill using a water wheel appears in the writing of Marcus Vitruvius Pollio, a Roman architect in the first century B.C. Water wheels have turned the mills of Western Europe and America into modern times.”¹³

The power acquired from water wheels changed the manufacturing process dramatically. Instead of items or products produced by hand, the owners of the facilities created ways to have machines produce them. This change in production, now known as the Industrial Revolution, began in England in the 18th century and ultimately stretched to neighboring countries such as France and Germany, and by the late 18th century came across the ocean to the United States.

As Europeans settled along the river banks, they utilized the energy of the water wheel to power mills to grind grain to flour, trees to pulp, spin wool to thread, and loom thread to cloth. The pulverizing power of the water wheel technology also made possible the mixing of other earth materials to make new compounds, such as black powder. This was very risky! The ingredients were carefully milled and mixed to create a volatile and explosive powder. People were finding that this black powder, later known as gunpowder, was useful in hunting and so the demand began. Initially, the production of black powder manufacturing in America was in its infancy stage and was not well-refined. The DuPont family, originally from France, saw this as an opportunity and decided to come to America with their advanced milling technology to manufacture a more refined and powerful black powder. They brought specialized skills and knowledge regarding the materials and resources that would be needed to create a successful business.

However, they first would have to identify a suitable location which had access to water power, usable as a means of transportation, and at a safe distance from a major port. They were able to find access to all of these requirements in a large parcel of land along the Brandywine, (now preserved and known today as Hagley Museum, in Wilmington, Delaware.) The success of this venture was complex and would be a huge undertaking. Besides having the physical components, they also needed to have knowledge and expertise in business, chemistry, manufacturing, and specific labor skills.

So the work began, The DuPont family had a wealth of business experience from their successes in France. First, acquisition of the main ingredients was needed for the black powder. This meant they had to import the raw materials from countries as far away as China, India, and South America. E.I. DuPont was an educated chemist with specialized training in the refining process of milling and mixing of black powder ingredients. He was their mastermind and knew others with similar expertise who would work with him in this venture.

They were also inventive mechanical engineers as they made adaptations and modifications of the water wheel technology to create a new and improved method to power the manufacturing process. As a result, the invention of a “raceway” was designed, a diverted canal of water from up-river, that ran along the river until it was at least a 10+ foot drop above a water wheel down at the bank. When the energy was needed to run the mill, the raceway hatch would be opened and the water dropped and “raced” 10 feet - creating an instant flow and force that mobilized the waterwheel, which in turn, turned the mill gears, and then emptied back out into the river. This invention created a constant and reliable water surge for powering not just the mills but the machine shop, or anything else rigged up to a series of gears.

The human element was just as important. Skilled labor was sought from various countries. The DuPont Company was very fair to their employees and families. They created safe homes, farms, a schoolhouse, gardens, and imposed strict safety rules to minimize injuries and tragedies. Most of all, they were known to be hands-on employers. They didn't say, “Go on, boys,” they said “Let's go, boys!”¹⁴ Even in the midst of harm, fire, or disaster, the DuPonts were there, and there were times when some lost their lives while attempting to save the workers and the business.¹⁵

By the 1880s, the black powder mills established along the Brandywine Creek by E. I. DuPont grew to encompass over thirty mills throughout the country which supplied powder to markets around the world. In his varied roles as chemist, partner, diplomat, negotiator, innovator, inventor, and powder man – indeed was “the life of the business” for over thirty years – Lamont DuPont was a key force in Du Pont's growth and change during this critical period.¹⁶ His improvements in black powder manufacturing led the company into the forefront of the blasting powder industry at a period of unprecedented growth. He founded the Repauno Chemical Company in 1880, which set the stage for Du Pont's world dominance in the production of dynamite by the 1920s. These

explosives were being used for unprecedented work such as; the expansion of roads and railroads, blasting through mountainsides to make tunnels, and creating quarries to access building materials. Simultaneously, industries such as textile manufacturing, mining, glass making and agriculture were also undergoing changes advances of their own.¹⁷

Stop and Pause

At this point in history today, we can look back and see the definite difference of cultural views and approaches that both the Lenape and Europeans had regarding the use of the earth's natural resource - flowing water. The Lenape Indians used it for their daily needs of food and travel. They made their own innovations with earth materials such as pottery, arrowheads, spears, nets, etc. These tools helped them to hunt, clean, travel and survive in their world. While the Europeans came with the innovations that were previously developed across Europe and Asia from before the Christian era began. The waterwheel helped accomplish the work that was difficult by hand and was demanded as a result of growing populations. The efficiency of the water wheel also allowed people to do other jobs that were necessary. In turn, more inventions and applications of the water wheel were adapted by businesses to manufacture a variety of other goods. Making extra product allowed the businesses to increase their power of trade and ability to pay the workers and expand the business. This flow of income allowed the town to grow and prosper, along with housing, buildings, factories, and roadways increased connections and communication between towns. Furthermore, this time of prosperity and innovation increased international exchanges of resources; created a more refined quality of living, improved health and care, as well as extended the human lifespan.

Hard to Argue

As a result of this unit there are a myriad of questions that can be asked of the students to reflect upon, to debate, as well as research. Although, I am writing the unit for the third grade, these questions can increase in complexity and depth for all grades.

Questions for discussion could look like this: Which culture is using the water the right way? Is there a right way? What is the definition of right? Or fair? Does the need for waterpower justify disregarding or taking over other cultures that don't believe in the same? Does the size of population necessarily define the rights to the waterway? Is it good business to make a profit from a natural resource? Does it matter if it was a renewable or non-renewable resource? Is there a pollution component that puts others at risk? How about the ripple effect of the increased population growth and all of its needs? Can you think of how this conflict is illustrated in our world today? After exploring the history of the past, what do you think is in store for our future? What is important to protect? Who should do what?

One Last Look

On one hand, the Lenape believed that the earth's resources were to be used respectfully and kept in balance to maintain harmony in the environment, thus allowing others who followed to have the same opportunity to be fed and/or fueled by nature. They believed that it was not there for them to profit, prosper, or own, but to live in harmony and take only what is needed to live.

It was on the same banks of the Brandywine that a French émigré named Eleuthère Irénée DuPont de Nemours established black powder mills, at what is now Hagley Museum, which gave rise to the DuPont Company of today. Their innovations were used to protect the nation, make tunnels for roadways, and blast for minerals, all which triggered a multitude of inventions that have now brought communications and connections across the world in a nanosecond. Their efforts continue today as they continue research and development in the areas of food, science, and technology with the focus of maintaining safety, and environmental balance. From the fortunes of the company and endowed by members of the DuPont family, many of the area's philanthropic institutions and foundations were developed to serve the public. In addition, beautiful acreage and gardens, like Longwood Gardens and Winterthur, have been preserved to protect, restore, and maintain the natural beauty of our homeland, here in the Brandywine Valley.

Objectives

This unit is aligned with the Delaware 3rd grade Social Studies/Geography Standards 2, 3, and 4, and it will connect our students to their our culturally-rich environment along the Brandywine, here in Wilmington, Delaware.

First, we will begin by observing the natural resources in our own backyard, specifically the Brandywine Creek area. During this process, students will personally observe the outdoors through their senses, record and discuss their observations. They will discuss the richness of the natural resources of their environment, such as, the wildlife, waterways, soil, and climate. We will then look at how these attributes attracted people to settle here. Students will also access authentic artifacts and maps to compare the area from both an aerial and historical viewpoint.

In interest groups, students will research how the Lenape Indians lived and utilized the Brandywine area. They will focus on the customs and culture of the Lenape Indians, such as their family structure, cooking, hunting, shelter, trading, beliefs, and/or rituals. My class loves to act-out and illustrate stories we have read in class, so for their research presentation, they will contribute to a class mural of a Lenape village and then dramatize their part of the Lenape community.

Second, students will trace the immigration of European settlers into the same Brandywine area. As they learn more about the Europeans customs and cultures they will

be able to identify distinct similarities and differences between the two populations, and learn how the two populations co-existed. They will also read and interpret a variety of maps, both historical and present, to see the changes over time.

The students will then focus on how differently the Lenape Indians and Europeans used the Brandywine as a water source. For example, the Lenape used the Brandywine to hunt, cook, wash, and trade, whereas, the Europeans utilized the Brandywine for its waterpower to drive mills. To achieve higher thinking, students will be asked to compare and apply this information to how other places, influenced by their culture, may be using water differently than us.

Third, students will look at how the invention of the waterwheel affected the economic growth, industry, and transportation in this growing region. They will trace the historical timeline of settlers, agreements, inventions, and politics as the region grew and developed. They will also be asked to observe how these changes influenced connections between places and regions. The ultimate goal for the students is for them to be able to make connections from the past to the present and apply them to the future. They should be able to understand why cities develop, and what are the necessary elements and cultural sensitivities needed to make an economically successful place or region.

For a unit project the students will be asked to design a successful, interdependent community which will utilize a water source such as the Brandywine River/Creek. This project will require them to consider how they will apply their new knowledge for the future. Are they planning for future needs of food, housing, agriculture, transportation, and/or energy?

Teaching Strategies

Experiential Learning

The students will have an opportunity to experience their environment, by walking on the grounds of Hagley Museum, going for walks in their backyards, as well as the immediate environment of their own school. The activities will be designed to involve their senses and the use of natural building materials. The students will also have the opportunity to dramatize the different roles of the Lenape.

Differentiated Instruction

Lessons and activities will meet learners' needs on multiple levels. The design of the activities will include choices regarding the format of expressing their acquired and applied knowledge, as well as the intensity levels. Due to the academic variances, I will give assignments that are both pre-designed and those that have free interest choices so both challenge and success are achieved.

Cooperative Learning

The students will be given opportunities to work in pairs and small groups, in which they will share their personal thinking, brainstorm, compare information, gather facts, and simulate life in a Lenape village or European settlement. Their final project will be to brainstorm and collaborate in a small group to design and create a futuristic, water-powered business and community.

Written and Oral Format

The students will have the opportunity to orally present their thinking, feelings, and findings throughout the lessons. They will also be asked to write responses such as; (1) identification of the main idea with supporting details; (2) informational with factual details; (3) narrative with sequential and/or personal anecdotes. They will present their final project, the students will describe their new settlements population, needs, natural resources, economic business, and what influenced their thinking and design.

Unit Study

Background

Prior to this unit, my students have had the opportunity to read the first, second, and third units in the ELA Scott Foresman series. These ELA units have given the students the opportunity to learn about economics, problem-solving, and man's connection with nature. These experiences have been scaffold in such a way that they are now much more prepared to research, discuss, and debate the topics of this unit.

The focus of the first unit was entitled, Dollars and Sense. This unit explored the need for money as a source of trade and currency, the ways in which to earn money, how to respect those who have worked for their money, and how to understand the value of money from both an economic and character-building perspective. The stories my students read were from various countries which gave a global understanding of the need and the effects of trade, money, and the effect currency has on communities and their development over time.

The second unit was entitled, Smart Solutions, which focused on the decisions that need to be made to solve problems. By looking closer at the process of creating solutions, motives were exposed, both good and bad, as well as the character traits of the decision maker. The students were then able to make many connections regarding the dynamics of creating solutions in their personal everyday lives.

As we approached the November timeframe, we also studied the journey and settlement of the Pilgrims. This lent additional insight and appreciation of the Pilgrims, such as: their passion and drive to make such a dangerous journey across the Atlantic

Ocean; their need to adapt their lifestyles to the New World; and how the Pilgrims coexisted alongside the Native Americans who were already settled in this new land.

The third unit is entitled People and Nature. This unit's main concept is how people and nature are connected. The stories tell of how different cultures appreciate nature, live in harmony, and learn by observing closely the lessons nature has to offer. We delved deeply into the concept of "enrichment." How does nature enrich our lives? I explained that enrichment cannot be bought, it can only be gained by a give and take of effort, appreciation, seeking for truth and/or goodness. It is here, where one will find harmony, peace, and light. This focus served as a segue along our journey into winter celebrations of light.

As we return from the winter break, the Water Cycle science kit will be waiting for us. But before we begin, we will pre-empt the unit with the following lessons. The students will explore the power of water in more ways than one: (1) water as an essential element of life; (2) its power which when harnessed has magnificent power to drive machinery designed for production to benefit growing populations; and (3) its power to rejuvenate, cleanse, and soothe the soul.

Lesson 1: Life as a Lenape

A Walk in Nature

The students will begin their journey to explore the world as a Native American, a Lenape along the Brandywine Creek, right here in Delaware. I will remind them of the field trip we took in the October, and take them on a virtual tour to revisit their footsteps and refresh their thinking and look at their natural environment with a new lens. Before we go outside, they will begin a KWL chart regarding what they know and want to learn about Native Americans.

Next, we will go for a walk outside, sit in a circle and quietly observe. Each student will have a clipboard and graphic organizer to record their observations of what they see, hear, smell, and feel. After a few minutes, I will ask them to go with a partner and explore to add to their lists. Before going back inside, we will regroup and talk about how we might make a dwelling in this environment. What are our natural resources? We can take a closer look at what the animals have done already, such as; nests in the trees, burrows, under bushes and thickets, etc...

Back in the classroom, we will share again, then re-categorize our observations to living (plants, animals, people) and non-living (rocks, water). Then discuss the difference between renewable and non-renewable resources. They will then identify what in the environment fits into each of those categories. Ask and discuss, "Why does it matter?" Watch video clip on <http://www.discoveryeducation.com> about Places and Regions/Native Americans and how their homes differed according to their environment's climate and natural resources.

Classroom discussion: What do you need to survive? (shelter, water, food)
Where might you find it in this environment? Students will work in groups to brainstorm where they would find these resources. (Shelter – Trees – wood to build, fire to cook and keep warm. Water – from the Brandywine. Food – fish, deer, rabbit, fox)

Lenape Research

We will discuss Native Americans, watch their favorite brainpop.com characters talk about how the Native Americans arrived in North America, their place in history, along with the events that contributed to their loss of population and eventual migration.

The students will then pick a topic to research about the life or role of a Lenape. Topics include: housing, farming, cooking, fishing, hunting, clothing and jewelry, and games. They will write their findings on one side of a large index card and illustrate the other side.

Classroom Mural

Compliments of the art teacher, we will have an outline mural of the Lenape Village across half of the classroom whiteboard. The students will attach their pictures onto the mural and complete the mural with additional color, labeling, and details. They will present their research written on the index card (text on one side and an illustration on the other.) This will be attached to the mural to make a flip –up description of the job or function.

During their presentation the students can dramatize what they have learned. For example, they may act-out how they used the water (by scooping water to drink, wash clothes from the river), make shelter (gather trees branches, mud, and grass for housing, skin hides,) and gather and make food (gather wood for fire to cook, fish, hunt animals for food, tend the gardens for crops, sculpting tools to hunt or fish, and/or thanking the spirits and animals for providing sustenance for living.
Optional: Since we have just finished reading a Native American play, they may write a skit to demonstrate and incorporate all that they have learned.

Discussion: (Level 1: sample questions)

When did the Lenape live in this area?

Why do you think they settled in this area?

List the natural resources they found in the area.

What is the name of the river that runs through the Brandywine Valley?

Discussion (Level 2 sample questions)

What would you do if you lived as a Lenape?

If you lived here during the 1800's, would you be happy? Why or why not?

What do you think occurred when the Europeans came and settled in the area?

If you were there, would you be happy?

What was the main idea or message of what happened during this time?

Reflection (Level 3 sample questions)

What would the Brandywine River area be like if the settlers never came?

Predict what will happen to the Lenape as more Europeans come to settle on this land.

Lesson 2: Europeans Come to Lenape Settlement Places and Regions

Discussion

We will discuss how Europeans brought a new set of living standards and cultural influences. They came from countries where the populations were greater, thus civilizations had become more complex. For example, there were greater demands for shelter, food, and trade. As a result, trading increased and resources were no longer used just for survival or for the immediate community. Production and trading for profit became the norm. Currency held more value than bartering or trading, and specialty products became high in demand. Inventions were continually being sparked to make it easier to create more necessities of life for the growing population. As a result, the inventions actually made life easier and afforded people with the time to become more educated and innovative.

Maps

We will look at a variety of maps and texts to compare and contrast the demands and changes as a result of population growth over time. The students will take a virtual tour of Hagley Museum and be reminded of what they saw and experienced during their actual field trip.

Classroom Mural

The process of creating the Lenape village mural will be repeated – but this time the students will pair up and research a job, site, or function specific to Hagley (i.e. stone masons, engineers, bricklayers, etc.) The new mural will illustrate the interdependence of jobs and show the need for outside resources (such as materials, labor, machinery) and the development of local and then expanded commerce. Students will go sign up for a specific role with a partner, and then go on a virtual Tour of Hagley. This map will be placed above the Lenape village.

The sharpest contrast to the Lenape village may be the unique ways in which the Europeans used the waterways for not only transportation but to power the factories. Chief among these were the waterwheel, the water turbines, and the technology that revolutionized manufacturing in this area.

Questions for Discussion

1. How did the expansion of business and technology effect the population growth? Transportation? Roadways? Communications? Education?
2. What does that tell you about the traits of the people or the challenges of time?
3. Do you think it solved the problem(s) or create a new problem(s)?
4. Where have you seen this in our world today?
5. What would you do to fix it or piggyback?

Lesson 3: Team Project

Create a business, with a partner, using the waterwheel technology. Illustrations are encouraged! Be prepared to answer the following questions:

1. What product will you make?
2. How does the waterwheel drive the production of your factory?
3. What resources will you use?
4. How will you make your business environmentally safe?
5. Can you predict how your invention will lead to more inventions in the future?
6. What skills will your employees need to be successful?

Extensions

Research: Inventions during 1600's, 1700's, 1800's, 1900's. Watch some video clips from "How Things are Made." Also see the Industries that have developed along the Brandywine from the 17th to the 20th century <http://www.industrialbrandywine.org/>

Discussion:

What do you think happened to the Lenape and other Native Americans tribes?
What significance did this have from a global perspective?

Class Debate:

Do you think the displacement of the Lenape was fair? Why or why not?

Optional assignments:

- Create a new ending to this time in history.
- Compare and contrast the lifestyles of the Europeans to the Lenape.

Assessments

Comparative Essay

1. Look at photographs of two communities, one is by a river or body of water and the other one is not.
2. Record your observations of both towns using a Venn diagram.
3. Given what you have learned about the power of water, write a compare and contrast essay about the two communities. What do you predict will happen to the future economic and population growth of the two communities?

Tic-Tac-Toe: The Power of Water

Choose three activities “in a row” to complete for your assignment. Label each activity with the correct number.

(Write, List, Define, Label) Define the three basic necessities of life.	2. Comprehension (Explain, Compare, Summarize) Summarize the Lenape lifestyle along the Brandywine	3. Diagram (Apply, Illustrate, Diagram) Illustrate both the Lenape village and European villages by the Brandywine.
4. Analysis (Analyze, Categorize, Solve) Solve the problem between the two cultures. How could they have co-existed in the same territory?	5. Synthesis (Create, Compose, Adapt) Create a waterwheel that will turn a gear – just like at Hagley Museum	6. Evaluation (Judge, Recommend, Forecast) Judge the actions of the European settlers. Did they respect the culture of the Lenape?
7. Comprehension (Outline) Outline the changes that occurred as the European settlers introduced and traded products from Europe, like guns, knives, and other materials.	8. Evaluation (Debate) Debate: Tell the pros and cons of using the power of water to make a profit.	9. Synthesis (Compose) Compose a poem or a song that describes life as a Lenape.

Resources: Annotated Bibliography

Delaware Indian Tribe History. Webifield Development. 2011. <http://www.accessgenealogy.com/native/tribes/delaware/delawarehist.htm> (accessed December 14, 2012). Historical information for numerous Native American tribes.

Engineering: <http://www.meteconline.org/manufacturing.php>
A great resource for Engineering/STEM/classroom materials.

Facts about the Lenni Lenape Tribe | eHow.com
http://www.ehow.com/info_8620011_lenni-lenape-tribe.html#ixzz2ApsOtNb
This website contains quick simple facts about the Lenni Lenape Tribe.

Glenn, Jerome C. 2011. "Updating the Global Scorecard: The 2011 State of the Future." *Futurist* 45, no. 6: 24-28. *Academic Search Complete*, EBSCOhost (accessed December 15, 2012).

Hagley Museum and Library <http://www.Hagley.org/library>
Hagley Museum and Library collects, preserves, and interprets the unfolding history of American enterprise. Hagley's collections document the interaction between business and the cultural, social, and political dimensions of our society from the late 18th century to the present. The library is organized into six departments: Manuscripts and Archives, Pictorial Collections, Imprints, Digital Archives, Conservation, and the Center for the History of Business, Technology, and Society.

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This article is about the role of energy on economic growth in the industrial revolution and an overview of waterwheel technology.

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Lachapelle, Cathy P., Cunningham, Christine M. *Engineering in Elementary Schools*. Boston: Museum of Science, 2011. This article and many others posted on the Museum of Science website addresses the need for teachers to incorporate engineering in their curriculum to increase the understanding that engineering is everywhere.

Mahenga, Orowing. *The Importance of Children's Participation in Environmental Issues*. September 6, 2010. <http://www.articlesbase.com/childhood-education-articles/the-importance-of-childrens-participation-in-environmental-issues-3212677.html> (accessed December 15, 2012)

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Stern, David I., and Astrid Kander. 2012. "The Role of Energy in the Industrial Revolution and Modern Economic Growth." *Energy Journal* 33, no. 3: 125-152. *Academic Search Complete*, EBSCOhost (accessed December 15, 2012). This article discusses various uses of Water technology and how these inventions lead to more technological advances.

Stromberg, Meghan. 2010. "Putting the Water to Work." *Planning* 76, no. 6: 34-36. *Academic Search Complete*, EBSCOhost (accessed December 15, 2012). This article describes the various ways water can be put to good use to drive machinery.

ThomasNet. *Man-Made to Machining - History of the Industrial Revolution*. 2012. <http://www.thomasnet.com/articles/custom-manufacturing-fabricating/history-of-the-industrial-revolution> (accessed December 14, 2012). This article discusses the changes made as a result of the Industrial Revolution.

West Chester, Historic Milestones of West Chester, Chester County, Pennsylvania http://www.downtownwestchester.com/view_program.php?id=228 (accessed December 14, 2012). This Website gives a tomeline of historical events.

Zubrowski, Bernard. *Manufacturing and Engineering Technologies, Education Clearing House*. 2002. This article discusses the need for future engineers in manufacturing.

Teacher CCSS Resources

Common Core in ELA/ Literacy: Shift 1: PK-5: Balancing Informational Text and Literature

<http://engageny.org/resource/common-core-in-ela-literacy-shift-1-pk-5-balancing-informational-text-and-literature/>

Websites

<http://industrialbrandywine.org/>

<http://www.articlesbase.com/childhood-education-articles/the-importance-of-childrens-participation-in-environmental-issues-3212677.html>

Supports Childhood Environmental programs i.e. ISO 14000

http://www.downtownwestchester.com/view_program.php?id=228

http://www.meteconline.org/view_abstract.php?id=1006&class_type=0

Science and Engineering projects for middle/high schoolers

<http://www.scholastic.com/teachers/article/native-american-contributions>

<http://www.hagley.org/library/exhibits/brandywine/chronology.html>

<http://www.hagley.org/library/exhibits/index.html>

<http://www.ncmuseumofhistory.org/collateral/articles/f07.earliest.american.explorers.pdf>

Lenape/Delaware Indians Websites

<http://www.accessgenealogy.com/native/tribes/delaware/delawarehist.htm>

<http://delawarein.webs.com/links.htm>

<http://nanticoke-lenape.org/wp/>

<http://www.anthro4n6.net/lenape/>

<http://tv.powwows.com/video/2013/01/03/native-american-music-wolves/>

<http://www.youtube.com/watch?v=bDHf1mHP2c4&NR=1&feature=endscreen>

http://www.ehow.com/about_4571299_the-delaware-indians.html

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<http://nanticoke-lenape.org/wp/>

<http://www2.mtlaurelschools.org/MLHistory/lennilenape.htm>

<http://www.usgennet.org/usa/nj/state/Lenape.htm>

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<http://delawarein.webs.com/delawarechiefs.htm>

<http://www.delawareindians.com/>

<http://www.native-languages.org/lenape.htm>

<http://www.lenapelifeways.org/lenape2.htm#clothes>

<http://www.nanticoke-lenape.info/history.htm>

<http://www.lenapeindians.com/>

<http://www.penntreatymuseum.org/americans.php>

<http://stevegreerphotograph.photoshelter.com/gallery/-/G00000COIBgNtXiw/>

<http://www.nanticoke-lenape.info/friends.htm>

<http://www.lenape.org/>

<http://www.Teachertube.com>

Teaching Books

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Cherry, Lynne, A River Went Wild, Harcourt Brace and Company, 1192.
Cipriano, Jeri, Native Americans, Benchmark Education Company, 2003.
Dobrin, Norma, Delawares, Melmont Publishers, 1963.
Dorros, Arthur, Follow the Water from Brook to Ocean, Harper Collins, 1991.
Edwards, Karen, People of the Coast, Newbridge, 2004.
Levine, Ellen, If You Lived with The Iroquois, Scholastic, Inc., 1998.
Levin, Michelle, The Delaware, Lerner Publication, 2006
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Mathieu, Joe, The Olden Days, Random House, 1979.
Shallop, Laura, A New Life in America, Newbridge, 2005.
Sonneborn, Liz, Changing Communities, Newbridge Educational Publishing, 2005.
Sneve, Virginia Driving Hawk, The Iroquois, A Holiday House Book, 1995.

Native American Legends

- Cohlene, Terri, Clamshell Boy, a Makah Legend, Watermill Press, 1990.
Cohlene, Terri, Turquoise Boy, a Navajo Legend, Watermill Press, 1990.
Cohlene, Terri, Quillworker, a Cheyenne Legend, Watermill Press, 1990.
DePaola, Tomie, The Legend of the Bluebonnet, Penguin Putnam Books, 1983.
Esbensen, Barbara Juster, The Star Maiden, Little, Brown and Company, 1988.
Martin, Rafe & Shannon, David, The Boy Who Lived with the Seals, G.P.Putnam's Sons, 1993.

Appendix: Implementing District Standards

Geography Standard Two K-3a: Students will develop knowledge of the ways humans modify and respond to the natural environment [ENVIRONMENT].

Geography Standard Three K-3a: Students will be able to identify types of human settlement, connections between settlements, and the types of activities found in each [PLACES].

Geography Standard Four, K-3a: Students will use concepts of place and region to explain simple patterns and connections between and among places across the country and world [REGIONS.].

History Standard Two K-3a: Students will use artifacts and documents to gather information about the past.

CCSS.ELA Literacy Reading Informational Text

Key Ideas and Details

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring

explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Craft and Structure

RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

Integration of Knowledge and Ideas

RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

Research to Build and Present Knowledge

W.3.7 Conduct short research projects that build knowledge about a topic.

W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Speaking and Listening / Comprehension and Collaboration

SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.

SL.3.1d Explain your own ideas and understanding in light of the discussion.

Curriculum Unit

**The Power of Water and Innovation Drives the
Culture Change of the Brandywine Valley**

Sonia D. Saunders

Title

Author

KEY LEARNING, ENDURING UNDERSTANDING, ETC.

Places are unique associations of natural environments and human cultural modifications.

Cultural differences produce patterns of diversity in language, religion, economic activity, social custom, and political organization across the Earth's surface. Places reflect the culture of the inhabitants as well as the ways that culture has changed over time. Places also reflect the connections and flow of information, goods, and ideas with other places. Students who will live in an increasingly interconnected world need an understanding of the processes which produce distinctive places and how those places change over time.

Students will understand that regions are defined by themes and/or common characteristics.

Regions are areas containing places with common characteristics. They are a major way we simplify a geographically-complex world. Regions can be used for analysis and synthesis. They have practical applications as in political administration or organizing economic behavior. Understanding regions and their use will allow students to better analyze and predict patterns and connections between and among people, places, and environments.

Many different types of sources exist to help us gather information about the past, such as artifacts and documents. Sources about the past need to be critically analyzed and categorized as they are used.

ESSENTIAL QUESTION(S) for the UNIT

How are places different in culture and activity?

How might connections between places affect their size and complexity?

How do places differ from regions?

How can regions be used to simplify an understanding of place diversity?

How might differences and similarities among regions result in connections between them?

What can I learn about the past from studying artifacts and documents? What can't I learn?

CONCEPT A

- Places are unique associations of natural environments and human cultural modifications.
- Students will understand that regions are defined by.

CONCEPT B

- Concepts of the site and situation can explain the uniqueness of places.
- As the site or situation changes, so does the character of a place.

CONCEPT C

- Students will understand that there are connections between different regions whether the regions are similar or different.

ESSENTIAL QUESTIONS A

How are places and regions connected?

ESSENTIAL QUESTIONS B

How do people exchange and use resources in different ways to satisfy their wants?

ESSENTIAL QUESTIONS C

How are places different in culture and activity?
How might connections between places and regions affect their size and complexity?

VOCABULARY A

Places, Regions, Landforms, Climate, Natural Resources

VOCABULARY B

Interdependence, Money, Specialization

VOCABULARY C

Patterns, Culture, Tolerance, Respect

ADDITIONAL INFORMATION/MATERIAL/TEXT/FILM/RESOURCES

www.DiscoveryEducation.com Videos: keywords- Geography, Places, Regions, Natural Resources, Renewable and Non-Renewable Resources, Native/Delaware Americans, Inventions, Water Power.
www.Fossweb.com Water, Science Kit Text and Resources,
www.Brainpop.com videos on Native Americans, Geography, Water Power.
 Scott Foresman Reading Series, Grade 3, Units 1-3
www.walke'sweb.com Extension Resources for Scott Foresman Reading Series.
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www.Thinkfinity.com / www.E-Pals.com / <http://www.hagley.lib.de.us/>

Endnotes

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- ¹² “Historic Milestones of West Chester”, West Chester, Chester County, Pennsylvania,
http://www.downtownwestchester.com/view_program.php?id=228 (accessed December 15, 2012)
- ¹³ “Inventions with the Waterwheel ,” Hagley Foundation, Hagley Museum
- ¹⁴ “Archives and Collections”, Hagley Museum and Library, <http://www.Hagley.org/library>
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- ¹⁵ *ibid*
- ¹⁶ “Black Gunpowder Production,” Hagley Foundation, Hagley Museum.
- ¹⁷ “The Role of Explosives in America”, Hagley Foundation, Hagley Museum, and
“Archives and Collections”, Hagley Museum and Library, <http://www.Hagley.org/library>
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