

Is the Next George Washington Carver Sitting in my Second Grade Class?

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Introduction

We just lost another one! We just lost Kiera Wilmot of Lakeland, Florida, formerly a promising young scientist/musician at Bartow High School. On April 22, 2013, prior to the start of the school day, on school grounds, Ms Wilmot mixed household chemicals and aluminum foil in a bottle and, to her surprise, created an explosion. The school administration called the police and Ms Wilmot was arrested in front of her classmates. After receiving an online petition of 195,000 protesters, the Florida State Attorney's Office decided not to file two felony charges, regarding terrorism, as planned. Ms Wilmot now attends an "alternative" high school. (Dillow, Popular Science, 5/16/13). Although a large showing of public support, and offers of scholarship have resulted (ABC Action News, May 26, 2013), Ms Wilmot has stated in an interview on the Tom Joyner Radio Show, that she no longer intends to pursue science as her major in college.

No scientist can ever be sure of results once starting to experiment. In this case there were no injuries or property damage, but in an interview to ABC Action News, the principal considers Ms Wilmot's experimental exploits a possible danger to other students. Ms Wilmot continues to be criminalized and no longer feels she has the freedom of unlimited experimentation. We will hope that she changes her mind.

As more and more African American youth will face the criminal system than will face the college system, we can only speculate our losses. The once and for all discovery of cancer prevention and its ultimate cure, the creation of the patch to the ozone layer, the sustainable farms that will not poison us with genetically modified food are a small percentage of the vast number of future essential inventions we will lose as

we continue to “dumb down”, under educate and criminalize our youth. The possible creator of the “smart” bomb that will only target politicians and school administrators has already been silenced.

George Washington Carver was not an intentional scientist or inventor. The former slave was an explorer with opportunity. It was his great fortune to have been a frail slave, who was allowed to harmlessly wonder about, collect useless objects. He was left to explore the possibilities of what can be done if the mind can wander and, if imagination is uninhibited. Carver was a genius, no doubt. But, is genius an inborn phenomenon or lack of inhibition. Is anyone capable of such genius if the same circumstances or opportunities come? Probably not, but, students of Tuskegee University, Carver’s home and resting place, have been so inspired.

One of Tuskegee’s most infamous graduates, Lonnie Johnson, I’m sure, can easily identify with his predecessor, Dr. Carver. Johnson is most known for his invention of the “Super Soaker”, a multi billion invention of a turbo charged water gun. Carver is most known for his invention of peanut butter, which he did not invent (Modern Marvels). Both are famous for inventions that are, no doubt useful, but non-essential, a child’s toy and snack. Much less is known about their many inventions that will be necessary for survival in the future. While Carver did not invent peanut butter, he did create engine fuel for cars and possibly rockets from the peanut (Modern Marvels) as a replacement of fossil fuel. Johnson did take his understanding of thermodynamics and energy to start his own company and create the Johnson Thermoelectric Energy Converter (JTEC), which can convert heat (from the sun) into electricity. (Atlantic.com/magazine/archive/2010/2011). Both men started from very humble beginnings but were well ahead of their times.

I was fortunate enough to participate in the course, Slavery and Race in American History, which focuses mostly in the era from the Civil War and Emancipation (1860’s to the Civil Rights Movement of the 1960’s and 1970’s. What is most fascinating to me is the “in-between” phase on our continuum in American history. The period after emancipation and prior to the Civil Rights Movement is rarely, if ever, taught in the lower grades, especially as African American history. However, in the one hundred years that is encompassed, African American history did not stand still. The Harlem Renaissance, which occurs during this era, is given credit for great literary and musical accomplishments, but little recognition is given to the great scientific achievements of African Americans that came from this same era. This era will host the invention of the techniques for making ice cream, by Augustus Maybolbourne, my personal favorite, (Wikeopedia.com) to the invention of a method of preserving and transferring blood, by Dr. Charles Drew. Each February, students will make a presentation of an African American inventor, but little note is given to the time period and the fact that so many inventions occurred during a time that was considered socially and politically repressive to most African Americans.

Kiera Wilmot is also living in a socially and politically repressive time period that has stifled her desire to pursue a scientific career. She may once again decide to pursue scientific experimentation, but will she ever feel as free to create as George Washington

Carver did? This curriculum is intended to encourage students toward scientific creativity. This curriculum is intended to produce the next George Washington Carver.

Overview

This curriculum is intended to focus on some of the many creations African American scientists, in particular, George Washington Carver. This curriculum is intended to encourage students in the second through fourth grades to re-create and expand upon some of the inventions of George Washington Carver. By exploring the histories of scientists and inventors from the 1860's to the 1960's, students will discover the many uses of the creations of these great inventors. Students will also focus on the history of one of the most prolific scientists and inventors of this era, George Washington Carver. Students will learn that like Carver, they can create through chemurgy, the development of new industrial chemical products from organic raw materials, especially from those of agricultural origin (www.thefreedictionary.com/chemurgy). This curriculum will take a multi disciplinary approach emphasizing social studies, science art, math and literacy.

The beginning unit of the curriculum will require students to explore the many inventors of the era, the inventions and how they are in use today. Students will choose an inventor, one of her inventions and how this invention has been modified to modern times. Students will make their presentations to their fellow classmates.

In the next unit, students will focus on George Washington Carver. They will view documentaries and read histories and some of his own writings. They will understand that Carver approached his discoveries as a means to help others. Students will learn that he received little to no money for most of his inventions, and, lived only to be an inventor. They will understand and hopefully, want for themselves his quest for experimentation, exploration and creativity.

The next unit will start students on a botany exploration, as Carver started, as an artist, studying, drawing and painting flowers. Students will dissect and understand the structure of flowers and then duplicate the structure with their own artwork. They will study and mix colors as Carver did.

The next unit will be an ongoing year long project, in which students will start fruit plants from seeds and attempt to genetically engineer different fruits by cross pollinating as the plants flower. This will be done through the creation of a classroom hothouse with artificial lighting. Students will analyze soil and understand how Carver's creation of crop rotation to keep soil chemically balanced is important to organic farming today.

The last unit will be on the use of chemurgy. Students will use simple products and foods to create chemical changes. Several chemical experiments will be suggested, but students will be encouraged to create their own experiments. There will be no mistakes to their discoveries, only new experiments to explore.

A love of exploration, experimentation, discovery and creativity should be the outcome of this curriculum. Students will be inspired by George Washington Caver and

the other scientist/inventors to make a lifelong quest of being inventors and the next George Washington Carvers.

Rationale

I recently drove a friend and her two-year-old daughter home. After a period of silence, the two year old let out the most high-pitched screech, that only a two-year can master. To her delight, she discovered that she could make the car swerve. After several repeated attempts, she discovered that a period of silence must precede the screech. She recognized the correlation and accepted cause and was correct. I'm sure this was a repeat experiment, practiced on others, I give this example to stress that even the youngest children crave discovery and recognize cause and effect. This curriculum will give a hands-on approach to exploring and experimenting and the opportunity to replicate.

A second rationale is that of the role models that children, especially African American children, are given. All too often, if African American heroes are not seen as social and political protesters, they are only recognized for their musical and athletic talents. Children need to understand that African Americans are more than entertainers. The era from 1860 to 1960 was, no doubt prolific with entertainment and the entertainers often participated in and even led social protest. The scientists/inventors and their contributions during this period have been minimized to such a degree that students rarely recognize their names and know of only the most menial inventions, even the ones they did not invent, like peanut butter.

Students should understand obstacles and barriers that African American scientists/inventors had to overcome in order to create. Even the most affluent had to have perseverance to overcome the racial stigma prevalent during an era when segregation and discrimination were legal. Understanding this history will instill confidence that they too are just as capable. Being a scientist/inventor is much more attainable than becoming a professional athlete.

This curriculum will take an interdisciplinary approach to studying scientist/inventors, why and how they made their creations. It will challenge their skills in literacy, math, social studies, science and art. This curriculum will meet the Common Core Standards of Pennsylvania in those areas.

African American Scientists/Inventors Overview

To keep heat out the car in the 1960's, my mother took a large piece of cardboard, wrapped aluminum foil on it and put it under the windshield. We lived in the city of Philadelphia, with no garage. The car was always in the sun. Even though her device worked, I was embarrassed. In the 1970's, a more sophisticated version was being sold in the auto supply stores. As I made my purchase, my mother reminded me of my embarrassment. She also lamented that she never would have thought to patent or sell her device, but was sure that the now patented shield originated from someone seeing hers. She also thought that she would have never been taken seriously, if she did try to get a patent herself. This is probably the thinking of many of us. We do not give our ideas worthy credit, because the invention seemed too simple. But, I would dare say that

there are probably a greater number of African Americans in which patents and recognition have not come. They are used to minimizing the importance of their creations and do not trust that they would be taken seriously enough to obtain a patent. I would venture even further to say that many who did try to gain recognition, patents and profits were denied based on racial bias.

In my search for African American scientists and inventors, I goggled for famous graduates of Tuskegee University. I was taken to the Tuskegee University website to a page created by their department of marketing. The pictures of Tom Joyner and Lionel Richie immediately come up. Under their pictures are listings of a bankruptcy judge and a one-time president of Dillard University among others, but no scientists/inventors, not even Lonnie Johnson.

When I went to the tab for Center of Excellence, twenty-one centers appeared, only two non-scientific. This was the school created by Booker T. Washington as a technical institute to teach farming and pragmatic skills. This was the school in which George Washington Carver lived and taught for over thirty years. When “Points of Distinction is tabbed, we learn that that Tuskegee claims to graduate more African American scientific material engineers with PhD’s than any other University. They also make claims of graduating more baccalaureates in science and engineering than any other University in the country. They have two programs that work directly with NASA and make claims of excellence in bioengineering, nursing and veterinary medicine. They claim that 75% of the nations African American veterinarians have graduated from Tuskegee. I guess the faulty word must be “famous” Like their mentor, George Washington Carver; Tuskegee’s scientists are not given recognition, not even by their alma mater.

In researching African American scientist and inventors, several websites will be suggested, including one of patent holders. Please be aware, that this is just the tip of the iceberg. African American scientists/inventors have created out of necessity being the mother of invention, since our first arrivals. We want to instill in our children that we must keep inventing.

George Washington Carver Overview

George Washington Carver was born in the early 1860’s as a slave in Diamond Grove Missouri. George and his mother were kidnapped. Moses Carver, the owner, paid for their search and return. Only George was returned. George’s mother was not returned and her whereabouts remained unknown. The Carvers raised George as their own child. George was a frail child and could not participate in fieldwork. He was therefore, allowed to spend his time exploring the farm and woods where he resides. (MacLeod, 2007)

George leaves Missouri to pursue education and employment. About 1890, George enrolls in Simpson College in Winterset, Iowa to study piano and art. George’s drawings and painting focus on flowers. (Modern Marvels) His artwork is so botanically correct that his art teacher encourages him to pursue horticulture. George transfers to Iowa State College of Agricultural and Mechanical arts in Ames Iowa. He continues to

create art and one of his paintings receives honorable mention at the World's Fair in Chicago in 1893. Upon graduation from Iowa State, George stays as a teacher and pursues his Masters degree in agriculture. (MacLeod, 2007)

In 1897, George Washington Carver forms a partnership with Booker T. Washington. He becomes a professor and the Director of Agriculture at Tuskegee Normal and Industrial Institute. Tuskegee was vocational institution based on Booker T. Washington's belief that African Americans should learn practical skills essential to finding employment and survival. Booker T. Washington, himself taught bricklaying. Other subjects were carpentry, blacksmithing, dressmaking and cooking. (MacLeod, 2007) Tuskegee Institute has since transformed into an academic university and such labor skills as bricklaying have been long abandoned. Tuskegee continues, however, to excel as a major power and influence in the fields of agriculture, engineering, veterinary medicine and science. (www.tuskegee.edu/centersforexcellence) All of these areas stem from the legacy of George Washington Carver.

Professor Carver will stay at Tuskegee (later named Tuskegee University) until his death in 1943. (MacLeod, 2007) Upon visiting and touring Tuskegee University, I learned that Professor Carver is entombed and memorialized at Tuskegee University. During his tenure at Tuskegee, Professor Carver made most of his inventions. He rejected many offers, including from Thomas Edison and Henry Ford, to work and create elsewhere. Professor Carver donated his salary back to Tuskegee in exchange for room and board and the freedom to teach, explore, create and assist Alabama farmers.

During his lifetime, Professor Carver was most devoted to helping poor black farmers, whose lands, either through purchase or sharecropping, were failing them. They were under financial pressure to produce more cotton even though the cotton crop depleted the soil of nitrogen and boll weevil beetles were destroying what little crop they were able to produce. Carver traveled from farmer to farm with his horse driven Jesup truck and encouraged farmers to grow legumes, especially peanuts for the upcoming year. This was meant to starve the boll weevils, who did not eat legumes. Once the pestilence was cleared, Carver taught farmers to rotate the cotton crop with legumes, which added nitrogen to the soil. Carver, furthermore taught farmers to be self-sustaining by growing other crops for food, such as sweet potatoes. When landholders for sharecroppers and other cotton buyers rejected the new crops of legumes and sweet potatoes, Carver solicited businessmen from industries to buy these crops. Carver's inventions, such as making ink, glue and fuel oil from peanuts, became known as chemurgy, the use of agricultural products for industrial products. This helped poor farmers sell their new crops. As success among farmers grew, Carver started the Farmer's Institute at Tuskegee to reach a wider population. Besides teaching what we now know as self-sustaining organic farming, Carver taught both farmers and industry lessons in recycling and ecology. (Nicholson, 1994) Unfortunately, industry and farmers found more success in synthetic chemistry. As we experience the toxicity and environmental damage of synthetic chemistry and depletion of natural resources, Carver's teachings, inventions and legacy are our hope for the future.

Professor Carver's work does not go unrecognized. He received many awards and his name becomes attached to many sites and objects, such as a submarine and cargo

ship. (Macleod, 2007) Professor Carver will only receive two patents with over 500 known inventions and recipes. (Modern Marvels) The modern world, in science and industry, has yet to fully utilize the true potential of his inventions.

Curriculum

The following curriculum will guide you through several lessons for African American scientists/inventors including George Washington Carver. There are several lengthy projects. The project in Unit three, Lesson Two is about one hundred days. It might be advisable to start the activities of this project earlier, depending on time constraints.

Unit One: African American Inventors of the Twentieth Century

Lesson One

Objective: Students will be able to investigate and identify various African American scientists and inventors from 1865 to 1965. They will be able to explain their inventions and possible obstacles the scientists/inventors had in creating or using or receiving recognition for their inventions.

Materials:

Websites:

www.theafrocentricexperience/contemporaryblackinventors,

Books:

Black Stars: African American Inventors by Otha Richard Sullivan, at least three copies (from Benjamin Montgomery to John P. Moon)

Black Stars: African American Women Scientists and Inventors by Otha Richard Sullivan, at least three copies (up to Shirley Ann Jackson)

Names of African American scientist and inventors from Black Stars, from 1865 to 1965, written on 3 X 5 cards

Internet access

Introduction: Teacher will explain that the hundred years between 1865 and 1965 were years between the end of slavery and the beginning of the Civil Rights Movement., During this time segregation and discrimination were legal. There were many restrictions on opportunities for African Americans regarding access to employment, housing, education and social interactions. "Separate but equal" laws lead to separate but unequal availability to most resources in the country. African Americans tended to live in their own separate communities with fewer resources. During this time, however, African Americans created and developed many creations in art and science. This will be the beginning of lessons and activities on achievements of African American scientists and inventors during this time period.

Step One: Each student will select a card of a scientist/inventor.

Step Two: Students will be assigned to three or four heterogeneous groups who can assist each other in reading.

Step Three: In the small groups, students will take turns to read aloud, the passages of their scientist or inventor.

Step Four: Teacher will explain that many African American scientists and inventors during this period, did not receive acknowledgement or payment for their inventions. The legal tool to receive acknowledgement and payment for inventions was a patent, in which an invention is registered with a central government agency and the name of the inventor is attached to that invention. Very often, payment is due to the inventor, if another person seeks to use that invention. Each student will take turns looking up their inventor on the website, www.theafrocentricexperience/contemporaryblackinventors, to see if their inventor has a patent for their invention. On their cards, they will write down the dates and patent numbers of their inventions if available.

Extended Assignment/Homework: Students will seek more information, via internet and write down any additional facts they could gather for their scientist/inventor. They will bring in any additional pictures that may be available.

Common Core Standards Met:

C.C.1.2 Reading informational text

C.C.3.5 Reading in Science and Technology

C.C.8.5 Reading in History and Social Studies

Unit One: African American Inventors of the Twentieth Century

Lesson Two

Objectives: Students will be able to identify various African American scientists and inventors from 1865 to 1965. They will be able to explain their inventions and possible obstacles the inventor had in creating or using or receiving recognition for their inventions. They will be able to complete pictorial explanations of the scientist/inventors and their inventions and make presentations.

Materials:

Books:

Black Stars: African American Inventors by Otha Richard Sullivan, at least three copies (from Benjamin Montgomery to John P. Moon)

Black Stars: African American Women Scientists and Inventors by Otha Richard Sullivan, at least three copies (up to Shirley Ann Jackson)

Names of African American scientist and inventors from Black Stars, from 1865 to 1965, written on 3 X 5 cards

Art materials including card stock for cover, crayons, markers or color pencils

Lined story paper (i.e. paper that is half lined)

Introduction: Teacher will announce to class, that now that they have done their own research of the various scientist/inventors, they will share their information with the rest of the class. They will do so, by completing a picture book and reading it to the rest of the class.

Step One: Students will start to write and draw a picture book of their scientist/inventor . They may include materials gathered from extended assignment (e.g. pictures and additional facts) to complete their books. Each book should be four to six pages, explaining the following:

- (1) brief biography and education
- (2) possible obstacles to this person's inventions
- (3) most significant invention and listing of other inventions
- (4) importance of the most significant invention to others

Step Two: Students will complete picture books in small groups. Group members will edit each other's writing.

Step Three: the class will come together. Students will take turns reading and displaying their picture books to the class.

Step Four: Each student will identify a surprising scientist/inventor or fact that they learned from another student's presentation. They will write down the name of the scientist/inventor and their invention.

Extended Assignment/Homework: Students will do an internet search of the additional scientist/inventor.

Common Core Standards met:

C.C.1.4 Writing

C.C.1.5 Speaking and Listening

C.C. 8.6 Writing in Science and Technology

C.C.8.5 Writing in History and Social Studies

Unit Two: Introduction to George Washington Carver

Lesson One

Objective: Students will be able to investigate and explain the significance of George Washington Carver as a scientist/inventor. They will be able to explain the impact of George Washington Carver's inventions and influence on American agriculture and industry.

Materials:

Websites/Videos: www.youtube.com/georgewashingtoncarverbywaterfordinst

Books:

A Man for all Seasons: The Life of George Washington Carver, by Stephen Krensky and Wil Clay

George Washington Carver by Tonya Bolden

Journey to Freedom: George Washington Carver by Charles W. Carey Jr.

George Washington Carver: Teacher, Scientist and Inventor by Lori Mortensen

A Weed is a Flower: The Life of George Washington Carver, by Aliko

George Washington Carver: An Innovative Life, by Elizabeth MacLeod

A Picture Book of George Washington Carver, by David A. Adler and Dan Brown

George Washington Carver: Botanist and Ecologist, by Lois P. Nicholson

George Washington Carver (On My Own Biography) by Andy Carter and Carol Saller

The Forty-Acre Swindle: George Washington Carver, by Dave and Neta Jackson
(preferably, one for each student)

Several packs of stick-on papers

Chart paper or poster board to tape together to form a timeline

Introduction: Teacher will explain that the study of African American scientists and inventors will now focus on one very important scientist/inventor. His name is George Washington Carver. George Washington Carver only received two patents, but he is known for more than 500 inventions. His inventions were very important to agriculture, technical industries and the environment.

Step One: Each student should have a copy of The Forty Acre Swindle. This is a historical fiction chapter book. It tells the story of a family of former slaves who have purchased forty acres of the plantation that once owned them. The land is depleted and does not produce much cotton, In need of more cotton seed, the father of the family uses the land as collateral to purchase more seed. George Washington Carver meets the family in his traveling Jesup Wagon. He encourages them to keep their land by using new techniques and different crops. Whether the family can keep the land, remains a mystery throughout the book. The class will read one to two chapters per week, either aloud or silently depending level of readers. A discussion should follow each chapter reading.

Step Two: Students will listen to the short story, I Want to be a Scientist Like George Washington Carver, by Waterford Institute at www.youtube.com/georgewashingtoncarverbywaterfordinst

Step Three: Divide class into three separate groups. Distribute three books per group. Each group will divide into twos or threes, depending on the size of the group and each subgroup will partner read one of the books.

Step Four: Teacher will place a long time in the front of the room. The line will start with the year 1864 and end with the year 1943 with ten-year intervals. Teacher will ask students to write a fact about George Washington Carver, other than his birth or death, on a piece of stick-on paper and place in the right place on the time line. Students will continue to do this until the time line is filled.

Step Five: Students will review the timeline and highlight one thing they found the most interesting about George Washington Carver.

Extended Assignment/Homework: Students will write a one to two paragraph essay on what they found most interesting about George Washington Carver.

Core Curriculum Standards Met:

C.C.1.3 Reading Literature

C.C.1.4 Writing

C.C.3.5 Reading for Science and Technology

C.C.8.5 Reading for History and Social Studies

C.C.3.6 Writing for Science and Technology

C.C.8.6 Writing for History and Social Studies

C.C.2.4 Measurement data and probability

Unit Two: Introduction to George Washington Carver

Lesson Two

Objective: Students will be able to identify and explain some of the many inventions of George Washington Carver. They will be able to identify how his inventions impact their current environment.

Materials:

Website: www.youtube.com/modernmarvelsgeorgewashingtoncarver

Notebooks and pencils

Several packs of stick on paper

Introduction: Teacher will explain that the books written for children give very limited information and were not very specific about George Washington Carver's many inventions. One of reasons they were not specific was because, Carver did not seek recognition or fame. Explain to class that they will watch a documentary about George Washington Carver, his inventions and legacy (i.e. how he influenced others).

Step One: Show the documentary Modern Marvels: George Washington Carver at : www.youtube.com/modernmarvelsgeorgewashingtoncarver. Encourage students to write notes on the various inventions of Carver.

Step Two: Ask students to write another fact or invention that they learned about George Washington Carver. Go around the class and have students share their discoveries.

Step Three: Students will write down an invention or fact on stick-on paper and add to the timeline.

Extended Assignment/Homework: Students will find something at home that may have been inspired by one of George Washington Carver's inventions.

Common Core Standards Met:

C.C.8.6 Writing for History and Social Studies

C.C.3.6 Writing for Science and Technology

C.C.2.4 Measurement, data and probability

C.C.1.5 Speaking and Listening

Unit Three: On Becoming George Washington Carver

Lesson One

Objectives: Students will be able to explore the anatomy of plants and flowers and be able to artistically express their understanding as George Washington Carver did.

Materials:

Website: www.nps.gov/georgewashingtoncarvertheartist

Various flowers and leaves, preferably chosen from a field trip (enough for each student to have two of each kind)

Disposable plastic gloves

Juvenile scissors

Centimeter graph paper

Drawing pencils

Watercolor paints with pallets

Introduction: Teacher will explain to students that George Washington Carver did not start school until he was about eleven years old. Prior to that, he spent his days wandering forests and fields, collecting and studying plant and insects. This gave him such extensive knowledge of plants that when he went to Simpson College, as an art major, he specialized in drawing plants and flowers and things in nature.

Step One: Teacher will lead students on a field trip to a field or wooded area for the purpose of each student collecting two of the same tree leaves and two of the same flowers. Students will be instructed about the proper attire, in which their arms and legs are covered. They will be instructed to identify and not touch poison ivy and any other possible harmful plant or insect in the area of the field trip. Students will use plastic gloves to touch specimens and juvenile scissors to cut their specimens.

Step Two: Students will examine their specimens. They should have two of the same leaves and flowers. They will take one of each leaf and flower and dissect them, i.e. tear them apart to see how they are made and then put them back together again. They should understand, from this activity how the specimens are constructed.

Step Three: Teacher will explain with art, sometimes artists want to recreate a subject as accurately as possible, sometimes they want to exaggerate or distort their subjects. Show students an example of a distorted painting. Show pictures of George Washington Carver's paintings from the book George Washington Carver the Artist. Students should note that Carver was very interested in accuracy of his flowers.

Step Four: Students will be given two pieces of graph paper. They will lay each intact specimen on the graph paper. Students will measure the dimensions of each specimen on the graph paper. They may either trace or draw to dimension, the specimen that they collected.

Step Five: Students will draw in details of specimens as accurately as possible.

Step Six: Teacher will instruct students to look for many different colors in each specimen. A leaf is not simply green, but different shades of green and there may be specks of brown or gray etc. This would be likewise with the flowers. A flower is not simply yellow. Teacher will instruct students how to use pallets to create different shades of a color or to blend two different colors to get the exact color of their specimen. Teacher will explain to students that George Washington Carver usually used different shades and colors of mud to accurately do his paintings.

Step Seven: Students will paint their drawings.

Step eight: If possible, tape the specimen beside the artwork and display work.

Step nine: Students will do a gallery tour of each other's pictures.

Extended Assignment: Students will find pictures of flowers and artistically reproduce these flowers. Bring eggshells in to class.

Common Core Standards met:

C.C.2.3 Geometry

C.C.2.4 Measurement, data and probability

Unit Three: Being George Washington Carver

Lesson Three

Objective: Students will be able to understand the process of growing plants from seed to fruit and how plants can be genetically engineered into hybrids.

Materials:

Website:

www.ehow.com/howtocreatehybridplants

www.ehow.com/howtocrossbreedflowersandvegetables

Hot bed and hot bed equipment:

Four by four soil frame or four buckets

Pebbles for the bottom of frames or buckets for drainage

two 40 lb bags of “organic” soil (i.e. soil without chemical or animal product fertilizer or pesticides)

grow lights and frame or hanging mechanism for lights

electric space heaters

water

watering cans

seeds of heirloom or non-hybrid fruit bearing plants (see Step Two)

bamboo or wooden poles or stakes at least 5 feet (for buckets only)

Raw eggshells

jars

Writing journals

Tweezers

Small artist paintbrush

Magnifying glass

Introduction: Teacher will explain how George Washington Carver is well known for his ability to crossbreed and make hybrid plants. He did experiments with plants to help farmers have larger and more nutritious crops. He is most known for making hybrids of sweet potatoes, peanuts, soybeans and other legumes. Remind students of what they learned through their reading and the documentary, that Carver rotated plants that he grew so that he could replenish nutrients in the soil. They should have read that legumes, plants with pods, such as peanuts, soybeans and black eye peas, replenish nitrogen into the soil. The farmers' cotton was failing because cotton plants take nitrogen out of the soil. Explain that this lesson is the start of a 100 day project in which the class will attempt to do what George Washington Carver did in cross breeding and making hybrid plants.

Step One: Set up either a flat bed frames with soil at least eight inches deep, or put soil in four buckets. Buckets are easier for growing most plants. Make sure at least one inch of pebbles are placed at the bottom of the flatbed or buckets for drainage.

Step Two: Plant the seeds. The decision should have been made prior to this lesson, either collectively or by teacher, but this is the most difficult part. There should be two different heirloom varieties of each plant. It is my recommendation that either squash or small melons (e.g. cantaloupe) be planted. Not only do they have the largest flowers, but also their flowers are male and female. The female flower will have miniature version of the fruit at its base. Because these plants have male or female flowers, they can only be pollinated by outside manipulation. If the plants are growing in an outside garden, bees or other insects pollinate them. Since these plants are growing inside, they must be pollinated by manipulation, thus making it easier to cross breed. The problem is that they must be grown in the flatbed soil frame, which is more difficult to set up and maintain. Other suggestions are cucumbers, which also have male and female flowers, but can be grown in buckets with poles or stakes. The flowers are smaller, therefore, more difficult to cross-pollinate. Other fruits to be grown in buckets with stakes are legumes, tomatoes or peppers. Before making a decision, do check with students' parents regarding allergies. Peanuts are not suggested, not only because of the high allergy occurrence (at least one student per class, guaranteed), but they would require more space than a four by four flat bed.

Seeds should be planted so that there is one plant of the two original varieties (e.g. one green squash plant and one yellow squash plant in one frame) as control varieties and there is one plant of the two original varieties in the other frame or two buckets to be used for cross-pollination.

If this project is started in the fall, seeds will probably have to be ordered through a seed company. Order only heirloom or non-hybrid seeds. Hybrid may be more difficult to cross-breed, since they are already cross-bred. Further more, most hybrids will not produce seeds that can be reproduced if the project is continued.

Students will keep a daily journal after seeds have been planted to record the growth progress of the plants.

Step Three: Continue the project. As seeds germinate, set up lights, so that each plant gets at least six hours of direct light per day. Leave the lights on all weekends and over holidays. Also, these plants need to stay warm. Electric space heaters should be nearby, not directly on, if the building is not heated over the weekends or holidays, Students should water and fertilize regularly.

Step Four: Explain that George Washington Carver believed in natural fertilizer and not store bought chemical fertilizer. Plants need three nutrients in the soil. They need the elements phosphorous for root development, nitrogen for leaf and stalk development and potassium for flower development. These three elements are in the soil, but some plants take too much out of the soil and some plants give these elements back to the soil. These elements are also found in living things that die and rot. George Washington Carver encouraged farmers to use rotting matter to replenish and fertilize the soil. The rotting matter could be dead plants from previous planting or animal waste from vegetarian animals (e.g. cow manure). Now many farmers are returning to natural farming, called organic farming, like George Washington Carver promoted. They rotate crops and use natural fertilizer and no chemicals or pesticides. Federal regulations do not allow today's organic farmers to use animal waste. Since most forms of rotted plants are not available for this experiment, the class will use what is available. That is animal waste from raw eggshells. Students will take eggshells that they brought. They will place them in glass jars, add water and place lids on jars. This fertilizer should sit about two weeks before using. And should be used to fertilize the plants about once a week. Over the time of the project, the fertilizer will have to be replenished. The smell diminishes as it goes into the soil.

Step Five: When the plants flower, follow the steps in the websites:
www.ehow.com/howtocreatehybridplants and

www.ehow.com/howtocrossbreedflowersandvegetables

Step Six: Students will make comparisons of the fruits that were produced from the original varieties to the crossbreed or hybrid varieties that they manipulated. Was the crossbreeding successful? What are the differences in the varieties.

Step Seven: Students will examine and write about the reasons for crossbreeding and making hybrids. They will re-examine the literature about George Washington Carver and why he crossbred plants. They will understand that Carver wanted farmers to produce bigger, more plentiful and more nutritious plants for food that they and their animals could live on.

Extended Assignment/Homework: In preparation of Lesson Four, teacher will send home a request that each child bring in one raw vegetable or a small amount a raw vegetable (i.e. a half pound of fresh peas).

Common Core Standards met:

C.C.3.5 Reading about Science and Technology

C.C.3.6 Writing About Science and Technology

C.C.2.4 Measurement, Data and Probability

Unit Three: Being George Washington Carver

Lesson Four

Objective: Students will be able create chemical changes that are made to raw food through temperature changes. Students will be able to duplicate George Washington Carver's improvisation and creation of recipes to encourage increased use of legumes and vegetables.

*This lesson is a daylong project in which other activities can be interspersed. This includes making a vegetable soup. This lesson also includes making ice cream and chemical changes resulting from ice being made colder. This is not an invention of George Washington Carver, but Augustus Jackson (1832) in Philadelphia. Both activities will show that cooking is chemistry, which was used extensively by George Washington Carver. Teacher should check on allergies to any vegetables or soy. This can be done as two separate lessons.

Materials:

Pot Luck Soup:

Six-quart slow cooker

Vegetables brought in by students

Back up ingredients from teacher: 28 oz can of chopped tomatoes, a quarter pound of dried beans, onion, macaroni, Bragg's Liquid Aminos for seasoning or soy sauce or sea salt

Vanilla Ice Cream:

Websites: www.howstuffworks.com/fiveminuteicecream

www.chemistry.about.com/makeicecreaminabaggie

or

Ice Cream Churn that uses ice and salt

Ingredients for ice cream recipe (see appendix)

Sixteen-pound bag of ice

Two cups of rock salt

Thermometer

Scientific Method Chart or chart paper to write method

Wooden or bamboo spoons for stirrers

Disposable paper bowls and plastic spoons

Paring knife

Notebooks and pencils

Book: Carver's Tomatoes by G.W. Carver and Anne Chambers

Introduction: Teacher will explain that George Washington Carver strongly encouraged farmers to grow their own food and live off their land as much as possible. Legumes, such as beans, were not used or grown much in Alabama, at the time. He convinced farmers to use legumes to feed both themselves and their animals. Furthermore, George Washington Carver was a chemist. Chemistry is the science that deals with the composition, structure and properties of substances and with the transformation that they undergo. As a chemist, Carver was interested in how substances are made and how they change when mixed with other substances or conditions such as temperature. This lesson will examine how substances, such as food will change when mixed together and with a change in temperature.

Step One: Students will present the vegetable they brought. They will state what it is and what it looks like. Teacher will present the dried beans. If available, show a fresh bean pod and show the difference. Teacher will explain that beans are the seeds of legumes, the plants that George Washington Carver encouraged farmers to grow to put nitrogen back into soil. Teacher should also explain that Carver encouraged farmers to also grow legumes to eat as a meatless source of protein. Beans can provide as much protein to the body as meat.

Step Two: Wash vegetables and teacher or responsible students will cut vegetables into bite size chunks. Put vegetables, canned chopped tomatoes and no more than a quarter pound dried beans into the slow cooker. Add enough water that ingredients are only half covered. Do not add too much liquid. Do not add soy sauce or salt until done. The soup should cook for about two hours on high or four hours on low, but each cooker is different and teacher should be familiar with length of time for cooking beans especially. Add macaroni during the last half hour if on high and last hour if on low.

Step Three: Have students take note on the ingredients that were added and to write time that cooking process started.

Step Four: At the end of two or four hours serve soup in paper bowls with plastic spoons. Before eating, students should make note of how vegetables were transformed, especially the vegetable they contributed. They should also note how the beans changed. They should taste and note changes. They should make a list of transformations that caused vegetables and beans to change.

Step Five: In the interim or as another lesson, the teacher will explain that an experiment is being done on how vegetable will be chemically changed by heat. An experiment will now be done on how freezing cold temperatures can transform food. Ask the class if frozen food is ever used at home. Ask how the food is transformed. Ask what is done to make food freeze. Ask what happens to water when it is frozen. Ask if there is anything

colder than ice. Explain to class that they will now do an experiment to see how cold temperatures transform food and to answer the question, "Is anything colder than ice?"

Step Six: Allow students to mix ingredients of ice cream churn recipe or recipes from the websites if the five-minute version is chosen. Set aside.

Step Seven: There is an option of using the ice cream churn, which was patented by someone named Nancy Johnson, not Augustus Jackson, (wikipedia.com), or the five minute versions in the plastic bags on websites: : www.howstuffworks.com/fiveminuteicecream or www.chemistry.about.com/makeicecreamnabaggie. There is no doubt that the five minute website versions are much easier and inexpensive and students can do their own experiments, but the churn version is preferable. The ice cream churn, must be the version that uses ice and salt. The crank can be electric or by hand.

Step Eight: Set up scientific method chart, with: (1)question/problem, (2)hypothesis, (3)experiment, (4)results, (5)analysis/conclusions

Step Nine: Ask and write the question, "Is there anything colder than ice, or frozen water?" Take a vote on the hypothesis and records on the chart. For experiment, write that class will make ice cream without salt and with salt. Allow students to examine rock salt and whether the salt has an extreme temperature.

Step Ten: Set up the churn or plastic bags using ice only, no salt. Take the temperature of the ice. Pour ice cream mixture into churn container or smaller plastic bags and seal containers. Churn for 45 minutes or shake for minutes suggested on websites.

Step Eleven: At the end of this time, examine results of first part of experiment. Observe the state of the frozen water in churn or plastic bags. Take a temperature of the frozen water and record under results for experiment part one. Make an observation of ice cream mixture and record if liquid or solid under results for experiment part one.

Step Twelve: Either make new ice cream mixtures or allow ice cream mixture to sit for half hour to go back to room temperature.

Step Thirteen: Set up churn or plastic bags with ice and salt as directed on instructions. Place ice cream mixture, either in churn container or small plastic bags into churn or larger plastic bags. Take the temperature of the ice and record. Churn for 45 minutes or until churn stops or shake in plastic bags for the suggested times on the websites.

Step Fourteen: Take a temperature of the frozen water and salt mixture from churn or plastic bags and record under results for experiment part two. Make observation of ice cream mixture and record if liquid or solid under results for experiment part 2.

Step Fourteen: Analyze results and record on chart under analysis or conclusion by answering question "Is anything colder than ice or frozen water?" Students should come to the conclusion that ice with or without salt was the same temperature in the beginning. The addition of salt, lowered the temperature of the ice, thus transforming the liquid ice cream mixture from liquid to solid. Explain to class that this was a discovery of

Augustus Jackson, an African American confectioner from Philadelphia.
(www.inventor.about.com/inventionoficecream)

Step Fifteen: Allow students to enjoy soup and ice cream. Explain that the transformation to the food that was prepared meets the definition of chemistry and reiterate the definition. Explain that when we are cooking, we are being chemists/scientists like George Washington Carver and Augustus Jackson. Explain that George Washington Carver loved to cook and share recipes to encourage farmers to grow their own food and be self-sustaining. He cooked for people from other industries to promote the many uses of legumes, sweet potatoes and other vegetables in order to encourage industries to buy these crops from the Alabama farmers.

Extended Assignment/Homework: Distribute several recipes from the book, Carver's Tomatoes. Encourage students to complete the food from the recipes with the assistance of an adult.

Common Core Standards met:

C.C.2.4 Measurement, data and probability

C.C.3.5 Reading for Science

C.C.3.6 Writing for Science

Unit Three: Being George Washington Carver

Lesson Five:

Objective: Students will be able to use chemurgy to perform chemical experiments with food and other common substances to create chemical changes. They will be able to explain how George Washington Carver was able to create many inventions by continuously experimenting with food and other resources that were immediately available to him.

Materials:

Website: www.howstuffworks/georgewasingtncarverandthepeanut

Two Scientific Method Charts

Experiment One:

Dark pennies

White Vinegar

Salt

Experiment Two:

Website: www.indiansoybeans.com/EducationalPDFs/mkplastic.pdf

Cornstarch

Water

Soybean Oil

Food Coloring

Plastic bags that zip

Microwave oven

Introduction: Teacher will remind students that they learned through readings and the documentary, *Modern Marvels*, that George Washington Carver constantly searched for different uses of food substances for both food and industrial uses. He did this to help farmers sell their crops to a wider variety of students. Explain to students that they will perform an experiment to recreate one of Carver's inventions.

Step One: Ask students to give examples of some of the uses that George Washington Carver made from peanuts, soybeans and sweet potatoes. They may refer to time line. Ask which inventions used crop for non-food uses. Examples would be peanut oil into fuel oil and soybeans into plastic.

Step Two: Set up Scientific Method Chart.

Step Three: Distribute materials for Experiment One.

Step Four: Have students observe and describe the pennies, making note that they were dark.

Step Five: Have students investigate and identify the vinegar and salt.

Step Six: Ask question, "How will pennies change if added to the vinegar or salt or both. Write question on chart

Step Seven: Develop a hypothesis or have students vote on hypotheses of any transformation of the pennies with the two substances. Write on chart.

Step Eight: Complete the experiment. Have students put a penny into a pile of salt. There should be no change. Have students put the same penny in the vinegar. The penny may lighten slightly. Have student mix a tablespoon of vinegar with a teaspoon of salt. Add the penny. The penny should lighten. Write the steps of the experiment on the chart. Write the results.

Step Nine: Ask students what conclusion they have about the transformation of the penny. They should understand that neither substance by itself could make a transformation of the penny, but when the substances are mixed, they create a chemical change that results in the transformation of the penny. Write the conclusion.

Step Ten: Explain to students that they will complete an experiment that lead to George Washington Carver's invention of plastic from soybeans. They will be using chemurgy.,

the chemistry that transforms agricultural substances into industrial products. Remind them of the plastic car that George Washington Carver created with Henry Ford. The body of the car was made of soybean plastic and the fuel used was made from peanut oil.

Step Eleven: Complete procedure for making plastic from soybeans using the website: www.indiansoybeans.com/EducationalPDFs/mkplastic.pdf. Fill out the Scientific Method Chart to go with procedure.

Step Twelve: Ask students about their conclusions that very simple products that are used every day in the kitchen, can be used to make or transform other objects.

Extended Assignment: Ask students to find food substances to mix together make a new substance. Send a form of the scientific method to have students record their experiments and findings.

Extended Assignment/Homework: Explain to students that this is the last lesson about George Washington Carver, but they should continue to investigate. Have students visit the website: www.howstuffworks/georgewasingncarverandthepeanut, and go to the article, “What Were George Washington Carver’s Inventions?” They should select a section of the article and find an invention they were unaware of. They should create a poster of George Washington Carver with this invention and “market” this invention. George Washington Carver should be given credit, but they should convince the reader why they should buy this invention.

Common Core Standards met:

C.C.2.4 Measurement, data and Probability

C.C. 3.5 Reading for Science and Technology

C.C.3.6 Writing for Science and Technology

C.C.1.5 Speaking and Listening

Appendix

Ice Cream Recipe

Annotated Bibliography

Pennsylvania Common Core Standards Met

Sue's Favorite Vanilla Ice Cream

Ingredients

2 cups of whole milk

2 cups of half and half

2 cups of heavy cream

1 cup of raw sugar

1 tablespoon of vanilla extract

Mix all ingredients together and stir with a whisk until all of the sugar dissolves.

Put in an ice cream churn container and freeze according to manufacturer directions.

Annotated Bibliography

Websites:

"Black Inventors through American History." *Black Inventors through American History*. N.p., n.d. Web. 13 July 2013. <<http://www.black-inventor.com/Black-Inventors.asp>>.

This is a comprehensive list of African American inventors

"Centers of Excellence." *A Rich Tradition of Service*. N.p., n.d. Web. 14 July 2013. <http://www.tuskegee.edu/about_us/centers_of_excellence.aspx>. Tuskegee University's commitment to agriculture and science.

Contemporary Black Inventors." *The Afrocentric Experience*. N.p., n.d. Web. 01 June 2013. <theafrocentricexperience.com/index.php?option=com_content&view=article&id=81:black-inventors&catid=90:black-inventors&Itemid=124>. African American inventors with patents

"George Washington Carver's Biography." *YouTube*. YouTube, 13 Mar. 2012. Web. 13 July 2013. <<http://www.youtube.com/watch?v=OX5cWojf61U>>.

This is a documentary from the History Channel series Modern Marvels

"George Washington Carver: The Artist Grade Four." National Park Service, George Washington Carver National Monument, Diamond Missouri, n.d. Web. 01 June 2013. <www.nps.gov/gwca/forteachers/upload/Carver%20the%20Artist%20Curriculum.pdf>.

This is a book of the art work of G.W. Carver, with activities for students.

"How Ice Cream Works." *HowStuffWorks*. N.p., n.d. Web. 13 July 2013. <<http://science.howstuffworks.com/innovation/edible-innovations/ice-cream3.htm>>.

This gives detailed instruction on how to make ice cream in five minutes.

"Lonnie G. Johnson." : *Inventor of the Super Soaker®*. N.p., n.d. Web. 13 July 2013. <<http://www.black-inventor.com/Lonnie-G-Johnson.asp>>.

This documents the inventions of Lonnie Johnson, a graduate of Tuskegee University.

"Make Ice Cream in a Baggie." *About.com Chemistry*. N.p., n.d. Web. 13 July 2013. <<http://chemistry.about.com/cs/howtos/a/aa020404a.htm>>.

This gives detailed instruction on how to create ice cream in a baggie.

"Make Your Own Plastic at Home." N.p., n.d. Web. <www.indianasoybean.com/EducationalPDFs/mkplastic.pdf>.

This gives detailed instruction on how to make plastic from soybean oil and cornstarch.

Oostenburg, B. Ellen Von. "How to Create Hybrid Plants | EHow." *EHow*. Demand Media, 21 Dec. 2009. Web. 13 July 2013. <http://www.ehow.com/how_5783672_create-hybrid-plants.html>.

This is detailed steps of how to create a hybrid plant.

"Soybean Car." *Wikipedia*. Wikimedia Foundation, 07 Jan. 2013. Web. 13 July 2013. <http://en.wikipedia.org/wiki/Soybean_Car>.

This is documentation that a soybean car was actually created, however, credit is not given to G.W. Carver

"State Drops Charges Against High School Student Arrested For Science Experiment." *Popular Science*. N.p., n.d. Web. 13 July 2013. <<http://www.popsci.com/science/article/2013-05/state-determines-high-school-student-curious-about-science-not-criminal>>.

This is an article regarding the arrest of Kiera Wilmot who was arrested for conducting a science experiment.

"Tuskegee University." *Wikipedia*. Wikimedia Foundation, 07 Dec. 2013. Web. 14 July 2013. <http://en.wikipedia.org/wiki/Tuskegee_University>.

"What Were George Washington Carver's Inventions?" *HowStuffWorks*. N.p., n.d. Web. 13 July 2013. <<http://www.howstuffworks.com/innovation/famous-inventors/george-washington-carvers-inventions.htm>>.

This is an extensive list of inventions of George Washington Carver.

Books:

Adler, David A., and Dan Brown. *A Picture Book of George Washington Carver*. New York: Holiday House, 1999. Print.

This is a simplistic biography of G.W. Carver as a helper of poor farmers.

Aliki. *A Weed Is a Flower: The Life of George Washington Carver*. Englewood Cliffs, NJ: Prentice-Hall, 1965. Print.

This is a biography of G.W. Carver as a botanist and plant doctor.

Bolden, Tonya. *George Washington Carver*. New York: Abrams for Young Readers, 2008. Print.

This is an extensive biography which chronicles the life and achievements of G.W. Carver with actual pictures and the context of American history.

Carey, Charles W. *George Washington Carver*. [Chanhassen, MN]: Child's World, 1999. Print.

This is a simplistic biography of G.W. Carver. It has actual pictures of Carver as a scientist.

Jackson, Dave & Neta. *The Forty Acre Swindle: George Washington Carver*. Minneapolis: Bethany House, 2000. Print.

This is a historical fiction chapter book about a family on the verge of losing the forty acres. They had purchased land from the plantation on which they were slaves. The land was depleted and their cotton crop was failing. George Washington Carver visits in his Jesup Wagon. It remains a mystery if they can save their land by using George Washington Carver's teachings.

Krensky, Stephen, and Wil Clay. *A Man for All Seasons: The Life of George Washington Carver*. New York, NY: Amistad, 2008. Print.

This is a biography of G.W. Carver as a botanist and a teacher.

MacLeod, Elizabeth. *George Washington Carver: An Innovative Life*. Toronto: Kids Can, 2007. Print.

This is an extensive biography, which chronicles with actual pictures in the context of American history.

Mortensen, Lori, and Niamh O'Connor. *George Washington Carver: Teacher, Scientist, and Inventor*. Minneapolis, MN: Picture Window, 2008. Print.

This is a simplistic biography of G.W. Carver as a teacher, scientist, inventor and businessman.

Nicholson, Lois P. *George Washington Carver: Botanist and Ecologist*. New York: Chelsea House, 1994. Print.

An extensive and indepth biography of George Washington Carver which advocates for the use of his inventions into the future to advocate for modern ecology.

Sullivan, Otha Richard, and James Haskins. *Black Stars: African American Women Scientists and Inventors*. New York: Wiley, 2001. Print.

This is a comprehensive listing of African American female scientists and inventors spanning the eras from the years 1706 to 2000.

Sullivan, Otha Richard, and James Haskins. *African American Inventors*. New York: Wiley, 1998. Print.

This is a comprehensive listing of African American inventors, mostly male, which spans the eras from the years 1731 to 1992.

Carver, George W., and Anne Chambers. New York: Lakehouse, 2013. Print.

This is an electronic book with 115 original recipes of George Washington Carver using tomatoes.

Pennsylvania Common Core Standards Met

English Language Arts

C.C.1.2. Reading Informational Text: Students read, understand and respond to informational text-with an emphasis on comprehension, vocabulary acquisition and making connections among ideas and between texts on a focus of textual evidence.

C.C.1.3 Reading Literature: Students read and respond to works of literature-with emphasis on comprehension, vocabulary acquisition, and making connections among ideas and between texts, with a focus on textual evidence.

C.C.1.4 Writing: Students write for different purposes and audiences. Students write clear and focused texts to convey a well defined perspective and appropriate content.

C.C.1.5 Speaking and Listening: Students present appropriately in formal speaking situations, listen critically and respond intelligently as individuals, or in group discussions.

Math

C.C.2.3 Geometry: Students make sense of problem and persistence in solving them, construct viable arguments and critique the reasoning of others, look for and make use of structure, read abstractly and quantitatively, model with mathematics, attend to precision, look for and express regularity in repeated reasoning.

C.C.2.4 Measurement Data and Probability: Students make sense of problem and persistence in solving them, construct viable arguments and critique the reasoning of others, look for and make use of structure, read abstractly and quantitatively, model with mathematics, attend to precision, look for and express regularity in repeated reasoning to solve problems to measure and estimate length in standard units using appropriate tools. Students will also solve problems involving measurement and estimation of temperature, liquid volume, mass and length.

Reading in Science and Technology

The Pennsylvania Department of Education has not adopted or established Common Core Standards in this field for grades below six, however, the following standards were met in this curriculum:

C.C.3.5 Students read, understand and respond to informational text-with an emphasis on comprehension and making connections among ideas and between texts on a focus of textual evidence. Students will site textual evidence to support analysis of science and technical texts. Students will integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g. in a flow chart, diagram, model, graph or table)

Writing in Science and Technology

The Pennsylvania Department of Education has not adopted or established Common Core Standards in this field for grades below six, however, the following standards were met in this curriculum:

C.C.3.6 Students write for different purposes and audiences. Students write clear and focused texts to convey a well-defined perspective and appropriate content. Students write informative/explanatory texts including the narration of historical events, scientific procedure/experiments or technical process.

Reading for History and Social Studies

The Pennsylvania Department of Education has not adopted or established Common Core Standards in this field for grades below six, however, the following standards were met in this curriculum:

C.C.8.5 Students read, understand and respond to informational text-with an emphasis on comprehension and making connections among ideas and between texts on a focus of textual evidence. Students will site textual evidence to support analysis of science and technical texts. Students cite specific evidence to support analysis of primary and secondary sources.

Writing for History and Social Studies

The Pennsylvania Department of Education has not adopted or established Common Core Standards in this field for grades below six, however, the following standards were met in this curriculum:

C.C.8.6 Students write for different purposes and audiences. Students write clear and focused texts to convey a well-defined perspective and appropriate content.