



***The Potato; from Peru to Our Table:
How the Columbian Exchange Played a Role in Demonstrating the Value of Potatoes
from Latin America to Our Classroom***

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This curriculum unit is designed for:
Integrated Science 6th-8th grade; 11-13-year-old

Key words: farm to fork, sustainable, scientific method, sugarcane, maize, Spanish Conquest, Incas, Peru, Columbian Exchange, terrace, innovative

Teaching Standards: See [Appendix 1](#) for teaching standards addressed in this unit.

Synopsis: This curriculum will make a significant step forward in our CMS curriculum by making connections with ELL scholars and families. This unit will also bring to light the importance of locally grown foods. As this curriculum allows the scholars of Coulwood STEM Academy to undertake the task of raising food, there comes along with it an inherent respect for the land and the food alike.

In addition to respecting the fruit of their labor, the scholars will also be learning about how Latin American culture has an impact on them here in Charlotte, NC. From the early 1400's the Incas of Peru exemplified the ingenuity we would expect from a modern civilization. Reading about the Incas can garner respect. If the scholars at Coulwood never get outside the walls of the west-end learning community, or read about how we get our food, like a potato, or meet someone like me, then they may never experience the joy of this effort that was so common in our community just a few years ago.

We will also celebrate the scholars' accomplishments with their families. Overall, we plan to honor cultures both past and present, land, plants, and each other. We will do this by gaining understanding of the Incan culture and potatoes.

I plan to implement this unit late this winter and conclude it in the spring to 35 students, both ELL and other scholars.

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Introduction:

Coulwood Middle School is located in the northwest corner of Mecklenburg County. We serve approximately 700 students; 70% of our students are African-American, 13% are Caucasian, and 13% are Hispanic. Our Free and Reduced lunch students represent 75.3% of our student population, 5% of our students are certified as Gifted; 14% qualify for services through the Exceptional Children's Department and 4% are certified as Limited English Proficiency. We are a Title I school serving in the West-West Learning Community.

My science curriculum is based on the North Carolina Essential Standards and paced according to the CMS yearly pacing guides. Activities are chosen that will create an inquiry based science experience for my students. Most lessons are interactive and are divided into teacher input, guided practice or additional investigation, independent practice or group inquiry activity, explanation of results or investigation and finally additional questions or ideas to explore. I incorporate the use of a SmartBoard and video clips from Discovery Education, NearPod, You Tube, and National Geographic on a daily basis. Students are assigned individual Chrome Books to use during class investigation.

Throughout instruction I engage student learning by including hands-on activities, labs, and/or investigations during most class periods. Labs and activities include both teacher directed inquiry labs and student created labs which address a general inquiry question. Students frequently participate in learning stations consisting of both research based and hands-on activities. The use of scientific method is a topic at the beginning of the year in nearly all middle and upper school classrooms. In fact, throughout most if not all lab settings, the scientific method is utilized in one form or another. This unit is written so that something as common as potatoes can be used in such a setting to communicate these scientific procedures and standards.

In the modern middle school setting it is not a priority to know from where your food comes. It's just not something kids or even adults talk about. Even with the emphasis we see on television and other media outlets encourage us to, "Eat Local", the phrase "From farm to fork" is now in the lexicon. So much so that if you were to begin to Google these phrases, Google finishes these entries for us.¹ These sustainable ideas are interwoven into our modern day ideas of food. I believe a more insightful idea is to ask "Where did these foods come from *originally*." This is where our investigation into Latin

American culture comes into play. So, we will investigate these origins as far back at the late 1400's as the Old World begins their worldwide influence.

One of the major crops coming from the Old World actually came from Latin America via shipping/trade. There are several major foods or crops that followed this to and fro path across the Atlantic Ocean. These crops, amongst many others, include sugarcane, maize, and potatoes.²

The use of potatoes through the use of scientific method not only focuses middle school scholars on the important process of scientific method which is a skill they need throughout their science career as a student, but it also begins to give exposure of the Latin American people/culture by giving evidence of the history of their food. The food that we will be using as an example is the potato. We will begin with the Peruvian Indians as they have great influence on this topic of potatoes.

Rationale:

Seventh grade is a huge transition year for students. In the student's mind, the newness of being in a new to a school is not what it was, yet they are still not the oldest. As a result of this factors, it is imperative to keep the scholar's interests up and keep the topics relevant. How are Incas and potatoes relevant? Well, the use of labs and mastering the use of scientific method during class is a great way to keep things exciting while still keeping on pace for the required standards.

The uses of potatoes in the lab are varied perhaps as varied as the types of potatoes we could use and study. Perhaps most importantly in a science class setting is the ability of the student to know what to look for in a lab. The reality is that if the student does not know what they are looking for in a lab, then what is the point? Throughout my experience as a classroom teacher, I have found that using the "Scientific Method" throughout the year keeps the students active and sharp in this area of recognition. Therefore, the main experiment we will be accomplishing will involve differing soils for the growth of modern day potatoes while still keeping in mind the Latin American origins of this fantastically versatile and delicious plant.

Although some of the same things can be learned without the use of hands on labs and experiments, each of these standards which are covered at the end of the school year will be memorable as the seventh grade scholars. It will be a unique way to learn a complex topic with something as common as a potato.

Objectives:

Charlotte Mecklenburg Schools science instruction is based on the North Carolina Essential Standards. Designing goals and activities based in these standards will create a unit consistent with state science objectives. According to the North Carolina Department of Education, students are expected to demonstrate scientific literacy as they describe, explain, and predict natural phenomena, identify scientific issues underlying national and local decisions, and pose explanations based on evidence derived from one's own work. Again, this supports our premise of the primary importance of the “Scientific Method.” As Cory Malone states:

The potato is an amazing example of a New World crop which became essential to European diet. Potatoes came from the Andes of South America and were important because they could resist cold and grow in thin soil. Used as cheap food for sailors, once the potato reached Europe, its value became obvious. The weak European soil was perfect for a potato crop and potatoes became food for the lower class. All over Europe, potatoes were a dietary staple. So much so that by the nineteenth century, Ireland was quite dependent on the potato as a source of food, crop failure forced thousands of people to migrate as their only choice to avoid starvation.³

Although the sugarcane and maize are also additional wonderful plants and great to study, the versatility of the potato is the obvious choice for study in North Carolina as we can grow potatoes here. One of the main reasons for choosing the potato is that we will be able to plant and harvest the potato before the school year is completed in June. This is not true of the other two plants. One of the values of having the students plant, tend, and harvest a plant is that their appreciation and respect for food will increase. Respect for provision is good for youth, elderly, and everyone in between. This can begin the process of appreciation which can lead to individual transformation and beyond.

Introduction

During this unit I plan to address the following process skills and concepts:

- Include the Incan culture and in particular, the raising of potatoes, as an example of how to perform the scientific method over an extended period of time.
- Identify and describe Independent, Dependent, and Controlled Variables within a science experiment or investigation.
- Identify and create qualitative and quantitative observations within a science experiment or investigation.
- Design and perform an experiment or investigation demonstrating the Scientific method.
- Collect, Record, and Share data within an experiment or investigation.

- Evaluate experimental data, draw conclusions based on the data, and communicate the conclusion within the science classroom.

Classroom Activities

- 1 lesson on Columbian Exchange for English Language Learners (ELL) will serve as background information
- 2 lessons on Latin American cultures will be used as introductory and background information
- 1 lesson on scientific method in order to understand the process
- Raising potatoes will serve as an example of how to incorporate the practical application of the scientific method
- Year-end potato celebration with potato bar which will bring about parent involvement for students both in the mainstream classroom and those as students in our ELL program

The Value

The value of each of the classroom activities begins with inclusion. Each of the students that are in Coulwood have value and demonstrating their value is integral to facilitate in the learning process.

First, the ELL lesson on the Incas will provide a look at a time and place that is not familiar to the students. In doing so, we value people and cultures that are not like our own. There is value in recognizing and respecting other, especially if this respect is based on these differences. This gives a feeling of inclusion for all participating.

The raising of potatoes can also include many scholars. If we can follow the simple steps provided in this curriculum unit, we can raise potatoes together. There is something very special about being able to provide the blessing of food for others. This builds on the inclusive community feeling.

Finally, this inclusive community reaches out from the students to the family. Our potato celebration is more than just at time for starchy deliciousness. The gathering of people, the spending of time, and the respecting of one another's food and culture are precursors to building a stronger tomorrow for us and our children. Being the adults, we take the lead on bringing value to others through something as simple as a potato.

Background Information for Teachers

The potato, from the perennial *Solanum tuberosum*, is the world's fourth largest food crop, following rice, wheat, and corn.⁴ The Inca Indians in Peru were the first to cultivate potatoes around 8,000 BC to 5,000 BC. The potato has its *roots* in Latin America. In his monumental work on the potato, Redcliffe Salaman could not help but give us a great insight when he penned, "For the early history of the potato was set on a stage that was dominated by the mysterious grandeur of the Andes, whose dread influence could never

have been long absent from the thoughts and actions of men, who thousands of years before the coming of Columbus, won for all mankind, this and other priceless gifts from the recesses of nature's storehouse." Additionally Redcliffe concludes that,

A thesis that today that is not likely to be disputed, then is a matter of no small importance to determine how and from which direction the original immigrant natives, the first who cultivated the potato reached the area we are discussing. This area comprises the countries Columbia, Ecuador, Peru, most of Bolivia, and the northern part of Chile, all of which except Columbia, were united under the Incas before the Spanish Conquest.⁵

Where Is the Potato's Origin in the Latin American Gene-Pool?

Even though cultivated potatoes occur commonly in Central America today, it is believed that prior to the Spanish Conquest that they were only found in South America. The potatoes were found in the high altitudes of the Andes Mountains from Colombia to Venezuela, through Ecuador, Peru, Bolivia, to northern Argentina, and even in some of the low altitudes of Chile.⁶ This means that their climate range is from a near- alpine to temperate zone. Excluding the Chilean location, the latitude is comparable to Spain.⁷

The varieties of potatoes is quite vast. The potatoes differ not just in appearance, but also at a scientific level. Most potatoes are tetraploid (5 sets of chromosomes per cell) although there are varieties that are diploid (2 sets of chromosomes per cell), triploid (3 sets of chromosomes per cell), and even pentaploid (5 sets of chromosomes per cell.)⁸ When classifying potatoes and putting them into *Genus-species*, the major division is based on number of chromosomes. Consequently, our background information and identification will also be based on the chromosome number.

There are two main groups recognized within the diploids. The main group with the diploids are *Stenotomum*.⁹ By and large the diploid potatoes are given more to a temperate climate such as the one here in the Carolinas. These potatoes usually are planted early in the year, as is described in this curriculum unit, so that there is enough time for two crops every year. These varieties that are diploid have a multiplicity of characteristics in terms of growing requirements. For instance, the *Goniocalyx*, which is known as the "Golden Potato of Peru" is of outstanding flexibility in the kitchen and has long been touted for its diversity of dishes. In addition, within the diploid group, there is a tuber known as *Ajanhuiri* which is known for its slightly bitter taste, but is quite frost resistant.¹⁰ The potato is as versatile not just in the number of dishes it can make, but also it is quite versatile in how and where it can be raised.

The triploids are divided into two groups. The first group which is known as *Chucha* appears to be as result of the hybridization of a diploid and tetraploid plants.¹¹

These tetraploids are considered a separate species and well so. The tetraploids are sterile and have little to no practical or commercial application.

The tetraploids, apart from the Chilean varieties, are classified in a group known as *Andigena* and occur throughout the Andean Mountains as described above.¹² The tetraploids are a hybrid in the same sense that the triploids are a hybrid; a combining of two different types of plants. It does appear that the tetraploids came from a hybridization of two diploids. Through the hybridization process, there appears also to have been introduced some unknown wild species because there are some unknown characters found in the genetic material. The tetraploids are *not* sterile, in fact quite the opposite is true.¹³

The Chilean tetraploids make up another part of the tetraploid group. These potatoes tend to have larger leaves than the non-Chilean varieties and are better suited for the climate found in England in regard to length of days. At one time, before anything was known about chromosome number, it was believed that the Chilean tetraploids were the forerunner of the Andean strain.¹⁴ W. F. Wright argued against this view on the basis of, “The greater number of cultivators and the greater range of variety between them.”¹⁵ The suggestion that the Chilean potatoes are the progenitors of all potatoes is no longer maintained in majority. Interestingly, there are some who hold to the idea that Chilean potatoes are the originators of our modern potatoes and that these potatoes did not begin with the Incas in Peru. Their beliefs were based mostly on appearance and not based on chromosome number. I guess everyone wants a piece of the pie; potato pie that is.

Regardless of where or who the potatoes began, it is worth understanding how scientists view this timeline. Originally, word of mouth and whoever wins the wars will tell how history will be told. And if they look the same on the outside, it does make some common sense that they are the same. The science *inside* the potato gives us more insight based on chromosome number, and it seems to be an open and shut case for the modern potato to have come from the Incas in Peru, not from Chile. I suppose the debate could go on, but modern science sides with the Peruvian Mountains.

Columbian Exchange Historically

In 1536 Spanish Conquistadors conquered Peru, discovered the flavors of the potato, and carried them to Europe. Before the end of the sixteenth century, families of Basque sailors began to cultivate potatoes along the Biscay coast of northern Spain. Sir Walter Raleigh introduced potatoes to Ireland in 1589 on the 40,000 acres of land near Cork. It took nearly four decades for the potato to spread to the rest of Europe.¹⁶

Global Potato Production

Presently, there are many countries that produce potatoes on a massive scale. With all the delicious ways to prepare potatoes we may think that the US is the largest producer. However, we barely scratch the top five. If we were to combine both China and India's production of potatoes, they would comprise over a third of the world's production of potatoes at 37.4%.¹⁷

Although potatoes are not at the very top of the list of world producers, potatoes do have the ability to be quite versatile. It is true that the potato is a weak stemmed plant that does not like the frost. However, the potato does like cool nights. The ideal temperature that they need is from 45 to 80 degrees F. The plant also thrives in a slightly acidic soil of pH from 5.0-5.5. Also required for many varieties is a soil temperature of 50 degrees F or above.¹⁸

The above parameters mapped onto the path of the potato may make a little more sense now. First, in Latin America and specifically with the Incan Indians of Peru, we can predict their success with the potato. We know that the mountainous terrain was not only a natural defense for their society, but it also provided them with opportunities to plant and grow crops that fit the above parameters. The Inca Empire ranged 2,500 miles from Ecuador to southern Chile before its destruction at the hands of Spanish conquistadors in 1532.¹⁹ It makes sense that the Incas were consumers of potatoes based on their climate and environment.

Archaeologist Ann Kendall began studying terraces in the Cuzco region of Peru in 1968. She intended to focus on Incan architecture and stonework, but she was soon captivated by the dry canal beds and terraces that beckoned from across the valley: "I thought about the problem that local people had no water and didn't cultivate this [agricultural system]," she says. She remembers thinking, "if only one could study traditional technology and rehabilitate all this in the Andes, wouldn't it be wonderful?"²⁰

She decided to study the development and technology of the Incan agricultural systems with the idea of rehabilitating them. Over the years, she learned how the Incan builders employed stones of different heights, widths and angles to create the best structures and water retention and drainage systems, and how they filled the terraces with dirt, gravel and sand. Ann was not the first to study the use of these wonderful terraces of the Incas.

In the 1600s, Garcilaso de la Vega, the child of a conquistador father and an Incan noblewoman, described the Incan terracing system in *The Royal Commentaries of the Incas*: "In this way the whole hill was gradually brought under cultivation, the platforms being flattened out like stairs in a staircase, and all the cultivable and irrigable land being put to use."

The terraces leveled the planting area, but they also had several unexpected advantages, Kendall discovered. The stone retaining walls heat up during the day and slowly release that heat to the soil as temperatures plunge at night, keeping sensitive plant roots warm during the sometimes frosty nights and expanding the growing season. And the terraces are extremely efficient at conserving scarce water from rain or irrigation canals, says Kendall. “We’ve excavated terraces, for example, six months after they’ve been irrigated, and they’re still damp inside. So if you have drought, they’re the best possible mechanism.” If the soil weren’t mixed with gravel, points out Kendall, “when it rained the water would log inside, and the soil would expand and it would push out the wall.” Kendall says that the Incan terraces are even today probably the most sophisticated in the world, as they build on knowledge developed over about 11,000 years of farming in the region.²¹

The way in which Kendall describes the intricacies of the Incan terraces makes us wonder if the Incas had additional practices, and in fact they were quite innovative in other areas. They also were able to conserve water in a place that did not receive an abundance of yearly rainfall, especially in the winter months. The total rainfall average in Cusco, Peru is 25.5 inches while in Charlotte, NC we receive 41.6 on average.²²

The reality is that the Incas were also able to freeze dry their food. In the highest altitudes of the Andes, freezing temperatures are pretty much guaranteed at night. The Incas used this to their advantage by bringing potatoes to these chilly environments and letting them freeze beneath a cloth. The residents of the wintry villages would then walk on the cloths in the morning to squeeze out the moisture from the potatoes. The repeated process would result in freeze-dried potatoes known as *chuño*. In the modern day, NASA astronauts regularly take freeze-dried food with them on their expeditions, but the process wasn’t hatched in a lab. The Incas developed it.²³

We would certainly agree that the role of the Incas in agriculture in general is amazing! They were a people of great depth in agriculture and were in general a truly incredible society. Here is a quick look into the marvelous and innovative ways credited to the Incas:

- The Incas created a highway and road system in Peru with over 18,000 miles of roads.
- The Incas had a type of postal system where relay messengers, *chasquis*, ran across rope bridges to deliver communications to the next team. Messengers lived in pairs, with one person sleeping and the other on alert for messages.
- The Incas performed successful skull surgeries.
- The Incas used a system of knotted and colored strings, a ‘quipu’ for records, math and possibly even language.

- The Incas believed in reincarnation.
- The Incas used a dry masonry method to construct buildings without mortar using stones fit so perfectly together that nothing can slip between them and it proved to be extremely resistant to earthquakes.
- The Incas used advanced farming techniques such as canals and ditches to irrigate their crops in Peru.
- The Incas administered intelligence tests to Incan children and based on their results they were either taught a trade or sent to school to become administrators or part of the nobility.
- The Incas worshiped the sun god Inti and the Incan emperor was believed to have been a direct descendent of the sun god.
- And last but not least, the Incas were the first to cultivate the potato in Peru.²⁴

Additional Ancillary Information Regarding Other Latin American Crops

As was already stated, the potato is not the only crop or area of interest when it comes to the Columbian Exchange and Latin America. The following are great resources for things like chocolate, coffee, tomatoes, sugarcane, maize, and the like:

- *The Oxford Handbook to Food History* by Jeffery Pilcher
- *The Columbian Exchange: A History of Disease, Food, and Ideas; The Journal of Economic Perspective*, Volume 24, Number 2²⁵
- *Molecular Evidence and the Evolution of Maize* by John Doebley²⁶
- *Landscapes of Cultivation in Mesoamerica on the Eve of the Conquest* by Thomas A. Whitmore
- *The Epic of Latin America; Fourth Edition*, by John A. Crow
- *Daily Life in the Incan Empire*; by Michael A. Malpass
- *Time Travel Guide, The Incan Empire* by Jane Bingham (good for younger scholars)
- *Chiles to Chocolate; Foods the Americas Gave the World*, by Nelson Foster and Linda Cordell

Interdisciplinary Education/ English Language Learners (ELL)

There are many benefits to teaching a topic that impacts more than one discipline, in this case both science and ELL students would be involved. The benefits include the following:

- Discover the value of integrating the study of various academic disciplines suited to their life-long interests.
- Learn creative solutions to some of today's most challenging problems.
- Become interdisciplinary thinkers who analytically and creatively embraces new ideas.
- Are prepared for graduate and professional study, and for careers in new and emerging fields.
- Develop collaboration skills while working with others who have different perspectives ²⁷

One thing that I have seen as a benefit in working with ELL is when you are able to respect someone's culture, great things can happen. As an educator, I want my students to learn from me, and we know that learning only happens in the midst of a relationship. Also, if I want my scholars to learn from me, I need to be willing to learn from them. In studying others and their culture these along with other wonderful things can occur. The connection piece of our educational system is sometimes aloof, however when we can engage the parents around their culture in which *they* are the experts, then real learning will occur on both ends.

The following entries to this curriculum unit intend on taking something simple and common like potatoes and give other cultures a place to show off. I have begun with the Incas and their incredible insight and ingenuity and then we go to the classroom. In the classroom we add to the cultural, the scientific. We do this through the building, planting and harvesting of potatoes. In the end we attempt to get the families of the participants involved. The grand celebration at the end will show off not just the individual cultures, but it will also spotlight the work done by the students throughout the year. As you begin this journey using potatoes, don't just think of it as a way to feed our bodies, but rather think of it as a way to of honor and respect both the land and the cultures represented in your classrooms.

Appendix 1: Implementing Teaching Standards

The following objectives from the North Carolina Essential Science Standards will be addressed within the unit:

Overall Standard 7.L.1

Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.

Substandard 7.L.1.2

Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).

- Students will use the scientific method to determine the difference between living and dead cells and how their properties are very different
- Students will research the genetic make-up of different potatoes
- Will act as the expert as they share their findings with their peers.

Overall Standard additionally impacted: 7.P.1, 7.P.2, 7.E.1

The rationale behind our Curriculum Unit will impact the student's ability to make sense of their experimental data throughout the year.

Strategies

During this unit I will utilize the following teaching/ classroom strategies.

Student Learning Teams, Interactive Technology, 4 C's of 21st century skills:

- Communication
- Collaboration
- Critical Thinking
- Creativity

While the background information will be done on a day to day basis based on the teacher's preference and timing, the following chart describes the planning for planting of the potatoes. We will begin with the background lessons, then to the scientific method and then we will discuss the application of the scientific method with how to grow and celebrate our potato accomplishments.

General Timeline for All Lessons

Topic	Days Needed	Purpose
Inca: Food/Farming	1	Introduction of culture of Incas (in print below)
Hernán Cortés travels	1	Introduction of Conquistador (linked below)

Aztec, Incan, and Mayan people groups	1	Multiple cultures introduction (linked below)
Scientific Method Lesson	2	Introduction to scientific method; slide show (see attachment, Copy of The Scientific Method PP CTL.ppt (in print below)
Scientific Method Activity	10-17 weeks	The growing and recording of your findings will take as long as it takes to grow your spuds
Raised Bed Planning	1	Early in the year begin the planning of materials and things needed to make the raised beds
Raised Beds Construction	2	Gathering the materials and organizing the tools needed will be one day; putting them together will be another day
Raised Bed Soil	1	Gathering the soil from an outside resource will not take long once you get it to the raised bed
Planting	1	Putting your plants in the ground take little time
Harvesting	Varies	It depends if you harvest all of your plants verses if you harvest them as you need them, a little at a time

Background Lesson

Incas: Food, Farming and Agriculture

The Incas were talented farmers. Their ground-breaking food discoveries and agricultural practices have left a lasting impact on the modern world. In this lesson, you will learn about the farming techniques and the food that fueled their hard work daily.

Farming & Food Storage for the Incas

Imagine you are traveling in the Andes Mountains and you come across neat rows of green grass and hollow carvings where water used to run through. This amazing landscape gives us clues about the Inca's revolutionary farming techniques. Much of their history was destroyed by the Spanish conquerors, but what remains can teach us about their advanced society.

The Incas had to create flat land to farm since they lived in the mountains. They did this by creating **terraces**. Terraces were carved steps of land in the mountainside. Not only did this genius way of farming help them grow crops, it was also great for irrigation and preventing drought. To make sure there was enough food year-round, the Incas freeze-dried food and stored it in special storehouses.

Fields were sacred to the Incas. Farming in the harsh Andean ecosystem was seen as war: farming was so difficult that the people would sing and pray while farming and offer sacrifices to the gods upon the arrival of the first harvest to show their thankfulness.

Cuzco was the Inca capital, and the harvest from the fields there would be used as offerings in sacred shrines. The Inca king would till the first soil of the year with a golden plow in hopes the land would be blessed and yield a bountiful harvest. Today, this area is known as the Sacred Valley and was considered the heart of the Inca Empire.

The Inca's Daily Diet

Incas would eat two meals a day and the mostly vegetarian diet would be full of potatoes, quinoa (a type of grain, pronounced: keen-wah), as well as maize (corn) and berries. The meat they did eat on a special occasion was guinea pig, llama, deer, duck and fish.ⁱ

Online Quiz - <http://study.com/academy/practice/inca-food-farming-quiz-worksheet-for-kids.html>

Two Additional Lessons for Describing Latin American Culture

- This link is great background information for this time period. The exercise begins in the year 1504 with Hernán Cortés traveling from Spain and it ends up comparing how each of the Aztecs and Incas were influenced by the Conquistadors.
https://drive.google.com/open?id=0B3hEbl_D_jBbUXBYcVlzbnUwcVE
- This link incorporates the Latin American culture and literacy. The topic includes the Aztec, Incan, and Mayan people groups and how they differ in location and religion.
https://drive.google.com/open?id=0B3hEbl_D_jBbUXBYcVlzbnUwcVE

Scientific Method Lesson

- Use the PPT below for your teaching of the Scientific Method which is directly above. The blanks will be directly on the PPT slides. [Copy of The Scientific Method PP CTI.ppt](#)
- For additional lessons for on Scientific Method – This resource uses a foldable template for hands on manipulation by scholars
<http://mjksciteachingideas.com/pdf/STITutorial6.pdf>

THE SCIENTIFIC METHOD

The scientific method is a process that is used to find answers to questions about the world around us. Is there only one “scientific method”? No, there are several versions of the scientific method. Some versions have more _____, while others may have only a few. However, they all begin with the identification of a _____ or a question to be answered based on observations of the world around us. They also provide an organized method for conducting and analyzing an experiment. What is a hypothesis? It is an educated guess based on _____ and your knowledge of the topic. What is data? It is information gathered during an experiment.

1) Identify the Problem

What do you want to know or explain? Use observations you have made to write a question that addresses the problem or topic you want to_____.

2) Form a Hypothesis

What do you think will happen? Predict the answer to your question or the _____ of the experiment.

3) Create an Experiment

How will you test your hypothesis? Develop a _____ for a reliable experiment and address safety rules. The variable that is _____ in an experiment is called the independent variable. The variable that you watch to see how it changes as a result of your changes to the independent variable is called the _____ variable. When graphing data that is collected, the independent variable is plotted on the ____-axis (horizontal axis). The dependent variable goes on the y-axis.

4) Perform an Experiment and Collect Data

Follow the steps in your procedure to perform your experiment. Record _____ and observations!

5) Analyze the Data

Is the data reliable? Do your data and observations from the experiment support your hypothesis? Is your data inaccurate or the experiment flawed? If YES, modify the experiment. _____ your procedure to address the flaws in the original experiment. Perform the _____ experiment and analyze the new data.

6) If the data is reliable, communicate the results.

Write a _____ that summarizes the important parts of your experiment and the results.

Identify the dependent variable and the independent variable in the following experiments.

1) A student tests the ability of a given chemical to dissolve in water at three different temperatures.

Independent:

Dependent:

2) A farmer compares how his crops grow with and without phosphorous fertilizers.

Independent:

Dependent:

Application of Scientific Method - Raised Beds for Planting Potatoes

This is a general timeline to follow so you can harvest before school ends in June

Date	Activity	Outcome
March 1	Place potatoes inside to allow them to insure <i>greening</i>	Prepare potatoes starts to maximize survival numbers of plants
March 15	Plant starts	Begin growing process
March 15	Mulch around plants	Protect plants
For next 10-17 weeks	Cultivate soil	All weeds out of beds to eliminate competitions for water and nutrients
May 30	Harvest potatoes	Enjoy the fruit (tuber) of you labor

See <http://veggieharvest.com/vegetables/potato.html> for more details

Potato Activity

1. Selecting a Potato

There are a few things to consider when selecting the potato that is right for you. Remember just because someone else thinks that their variety is the best, it may or may not be best for you based on your location, soil type, water availability, and your culinary preferences. Do your research. With that being said, here are a few varieties that have worked well for commercial and backyard farmers alike in the NC piedmont area. Here is the list of a few popular options:

- ‘Irish Cobbler’ is an early variety.
- ‘Viking’ is a red skinned potato, regular season variety.
- ‘Chieftan’ is resistant to potato scab (residual bacteria in soil.)
- ‘Elba’, ‘Rosa’ and ‘Sebago’ are all somewhat resistant to blight.

The following website, which is a part of the NC Department of Agriculture, may give some more insight as to which variety may be best for your uses. It also gives more information about several things including history, production, and shipping of your potato. It even has a quiz along with a link to Home Page of the NC AG Department where it is very user and kid friendly!

<http://www.ncagr.gov/agscool/commodities/potkid.htm>

2. Construction of Raised Bed

Materials

Many people are concerned about the safety of their wood frame. First, rest assured that CCA pressure-treated wood is banned as it was leaching Arsenic.

To ensure that the wood lasts, there are several options:

- Regular pressure-treated lumber sold today has a mixture of chemicals applied to prevent the moist soil and weather from rotting it. Although pressure-treated wood is certified as safe for organic growing, some people have reservations about using it and there are various eco-friendly alternatives.
- More expensive woods such as cedar contain natural oils which prevent rotting and make them much more durable. They are more expensive to buy but they will last many more years.
- Choosing thicker boards can make the wood last longer. For example two-inch thick locally-sourced larch should last ten years, even without treatment.

You could also use concrete blocks or bricks. Remember that concrete will increase the pH in soil over time.

Some people use railroad ties, however, we would advise against this. Though the very old ones may be fine, newer ties use creosote-treated timber which is toxic.

Planning and Design

- Consider a location that's level and has the right amount of sunlight.
- In terms of bed size, 4 feet is a common width. Lumber is often cut in 4-foot increments, and you also want to be able to access the garden without stepping into the bed.
- Length isn't as important. Plots are often 4 feet wide by 8 feet long or 4 feet wide by 12 feet long.
- The depth of the bed can vary. Six inches is a minimum. Plants need at least a 6- to 12-inch rooting zone, so 12 inches is ideal.
- Before you establish the bed, break up and loosen the soil with a garden fork so that it's not compacted. Go about 6 to 8 inches deep. For improved rooting, some gardeners like to remove the top layer (about a spade's depth), dig down another layer, and then return the top layer and mix the soil layers together.

Building the Bed

- To support timber beds, place wooden stakes at every corner (and every few feet for long beds). Place on the inside of the bed so that the stakes are less visible.
- Drive the stakes about 60% (2 feet) into the ground and leave the rest of the stakes exposed above ground.
- Ensure that the stakes are level so that they're in the ground at the same height, or you'll have uneven beds.
- Set the lowest boards a couple inches below ground level. Check that they are level.
- Use galvanized nails (or screws) to fix the boards to the stakes.
- Then add any additional rows of boards, fixing them to the stakes, too.

Soil for Raised Bed

- Fill the beds with a mix of topsoil, compost, and other organic material, such as manure, to give your plants a nutrient-rich environment.

- Note that the soil in a raised bed will dry out more quickly. During the spring and fall, this is fine, but during the summer, add straw, mulch, or hay on top of the soil.
- Frequent watering will be critical with raised beds, especially in the early stages of plant growth. Otherwise, raised beds need little maintenance.

3. The Collecting

Soil - Once you have constructed your raised bed, then selecting a soil is of primary importance. If we don't have the correct nutrients in the soil, we will not get the maximum yield from our crop. This is true regardless of which type of crop we have. In addition, if we have gone through all the trouble to build a raised bed in order to prevent compaction from foot pressure, it seems reasonable to consider an investment in good soil. In my experience as a backyard farmer, I feel as though I am more of a soil farmer than a potato, or tomato farmer. In other words, if we give the plant the proper things it needs, it WILL grow.

Getting soil is as easy as answering how much we need, and what kind do we need? First of all take the dimensions of your raised bed and use an online calculator and you can get how much of the material you need. Here is a useful link:

<http://www.calculatorsoup.com/calculators/construction/cubic-yards-calculator.php> . This link even has a place for you to put in your cost per yard so you will not experience sticker shock.

Your selection of soil is key. If you desire not to spend any money on soil and just get some material out of your yard, you may have great yields and you may not. Another option is you can also get several bags of material at your local hardware store. This is a good option, but not the best one. Your best option is to go to someone who makes their material. In doing so, you can eliminate the middle man, cut down on packaging waste and cost, and support local businesses. You can go to Google and figure this out by yourself, but the best option I have found is a local business in Dallas, NC named Earth Farm Organics. They have local distributors that are probably fairly close to your house. The products that come out of their farm are incredible. No weed seeds at all. I know of no better product.

Planting – Now it is time to plant the seedlings you have chosen into the soil you have selected. The time of year is key. Most potato farmers put their potatoes in the ground in mid-February or March so they can get two crops in per year. The early crop is the regular potato and the late crop is usually a variety of sweet potato. Here is a link to planting and harvesting times. <http://www.ufseeds.com/North-Carolina-Vegetable-Planting-Calendar.html> Again, your location will dictate your last frost of the winter and your first frost of the fall. You can plan and plant accordingly.

Harvesting – The National Gardening Association has a great sight for the details of harvesting so you can get the most out of your earlier efforts. Here is the link <http://garden.org/learn/articles/view/574/> . The best tool for digging is a 5- or 6-pronged fork. Dig down under a hill, then lift up. The dirt falls between the prongs, and you're left with a forkful of potatoes. There's less bending this way, too.

One great local resource in regard to raised beds and all things gardening in Charlotte, NC is a man named Don Rosenberg. His website is the <http://instantorganicgarden.com/>. Don is one of the good ones! He is easy to talk to, practical, well educated, and he is well connected to many CMS schools and community organizations.

Recording – The final hurdle of our activity is recording our findings with our two different types of soil. One of the soils we will have the purchased, and in the other soil native to the surroundings of the property. Below is the form we can fill out as we go and then we can complete our documentation.

Scientific Method Worksheet

Soil _____

Week Number	Sketch of Plant
1	
2	
3	
4	

5	
6	
7	
8	
9	
10	
11	
12	
13	

14	
15	
16	
17	

Scientific Method Final Findings

Record the total number of pounds each plant has for this type of soil

Soil _____

Plant	Pounds
1	
2	

3	
---	--

Record the total number of pounds each plant has for this type of soil

Soil _____

Plant	Pounds
1	
2	
3	

Conclusions

1. What were the total number of pounds for each of the sets of soil? _____
2. Which soil had more pounds? _____
3. Where there any outside variables that you think made the results what they are?

4. If you had to provide potatoes for your family, how many plants would you plant?

5. How did you come to that conclusion? _____
6. Was the good soil worth going to get/prepare in view how many more pounds you harvested? _____
7. Tell me why you feel that way? _____
8. What was the biggest thing you learned from this activity?

9. What did you like the most?

10. What would you change in this activity if you could?

4. **The Celebration**

What are we celebrating anyway? There are several things we should celebrate as a result of our efforts. First of all we have taken our scholars through the process of being part of something bigger than ourselves. We all had to come together in order to plan, build, and execute our plan of honoring the heritage and value of the cultures who are connected with the potato. So, how are we going to celebrate?

We are going to celebrate our accomplishments with a Potato Celebration. The steps we will take will be as follows:

1. **Announce** our intention to the parents of both our classes and those that are a part of the English Language Learners classes. We will announce our intentions via email. The email can be as follows:

Dear Parent,

My name is Tod Skinner and this in our science class we were able to plan, plant, tend, and harvest some potatoes. These potatoes that we planted were planted in a raised bed that we constructed. As we were tending to the well-being of our crop, we also studied about where the potato came from. We discovered that there were

several Latin American countries that were responsible for their origins. In fact, we also discovered that the Incas have been almost universally credited with their original cultivation.

We wanted to see if you may be interested in coming to Coulwood on Wednesday, May 31st at 6:00 PM for a time of celebration. We will be celebrating our accomplishments as a class for our crop of potatoes, but there is something else we would like to celebrate in addition to this. We would like for you to come and celebrate with us the diversity of culture we have in our school. We would like for you come and bring something from your culture that we could put on a potato, and people could get a little taste from your homeland.

We think that this would be a great way to celebrate and get to know a little bit about your home country. To me that is something worth celebrating!

Please let me know if you plan to attend, and which country you will be celebrating. I will give you more details as we get closer to the date.

Thank you for your consideration of this festive time together.

Sincerely,

Tod Skinner

2. **Enlist** the participants. Once the email or letter has gone home, then begin calling to confirm the date. During this time, be able to give specifics of how much of potato condiments you think you may need. It may also be necessary that you enlist an interpreter if your foreign languages (plural) are not very good. As the number grows and grows, it is time to get some help from outside the school.

There are always local business that can help with the food and beverage costs. The businesses that are on the radar first would be the local ethnic food restaurants. What we want is for them to provide just one thing. We will need beverages and maybe beans and rice. I say beans and rice because we have a student population of 15% Hispanic. This gives the business exposure to the community and they love this type of thing.

3. **Secure** a place at your school.

4. **Recruit** someone to put on social media. If you did all of the above and did not take pictures and have someone shooting it out, shame on you. Seriously though, use your schools Facebook or Twitter feed to let others know about this. When it is all said and done, shoot something off to your district office. They are always looking for community inclusion stories!

5. **Debrief** with students. The day after the celebration ask the students about their experience. Make sure to ask about *each stage* of the experience. Ask for honesty as it the only way to make it better next year. In addition to getting feedback from students, make sure to get feedback from the parents. This also gives you another chance to thank them for all they did to make the celebration a success.

6. **Thank** all those who made it possible. Write to the businesses and administration for their help. This gives closure for the event and you can announce your intention for the following year. If you can include a date for the next year, you will be in high cotton!

7. **Maintain** a file for next year. Keep all your contacts in one place either hard copy or e-file. Make sure to keep all the amounts of things you need. For instance, how many gallons of ice tea did you need?

Resources

1. List of Materials for Classroom Use for Activity
 - A. Materials to build raised beds (details to follow in “Construction of a Raised Bed”)
 - B. Seedlings of potatoes
 - C. Soils (2)
 - D. Garden tools such as pitch fork, shovel, and hoe.

2. Resources for Students
 - A. <https://kidskonnnect.com/history/ancient-inca/> - Background
 - B. <http://ask.mrdonn.org/incas/incasinventionsQ&A.html> - Quiz for kids about agriculture in the Incan empire/interactive
 - C. <http://incas.mrdonn.org/games.html> - 10 games that all relate to the Incas

3. Resources for Teachers

- A.  - Incas PPT
- B. <http://incas.mrdonn.org/powerpoints.html> - multiple links including information and games
- C. http://www.blueplanetbiomes.org/andes_plant_page.htm - The Wild Potato
- D. http://www.pbs.org/conquistadors/pizarro/pizarro_flat.html - Spanish Conquistadors
- E. https://create.kahoot.it/?_ga=1.107208322.169325480.1478978432&deviceId=cb591e59-44cd-4f27-9352-2f917e9ad73aR#quiz/d33d1784-3f7c-4a9f-854c-6c3e2b5cd7a5 - Kahoot game for more information on the Incas
- F. The Farm: Rustic Recipes for a Year of Incredible Food, by Ian Knauer; Excellent resource for wholesome food; See also his cooking show, The Farm.
- G. <http://study.com/academy/practice/quiz-worksheet-conquistadors-the-encomienda-system.html> - This site gives great information with games to middle school scholars featuring information on the Conquistadors.

NOTES

¹ “Farm to Table and Local Food Movement”, SouthUniversity.edu, last modified, August 12, 2011,
<https://www.southuniversity.edu/whoweare/newsroom/blog/farm-to-table-and-the-local-food-movement-49961>

² Cory Malone, Sarah Gray, Sean Ross, Katie Ryan, “The Columbian Exchange,” Accessed September 14, 2016.
<http://public.gettysburg.edu/~tshannon/hist106web/site19/plants.htm>

³ Cory Malone.

⁴ El Bassam, N. *Handbook of Bioenergy Crops: A Complete Reference to Species, Development*, (Washington DC, EarthScan Publishers, 2010) p. 430.

⁵ Redcliffe N. Salaman, *The History and Social Influence of the Potato* (Cambridge, United Kingdom: Cambridge University Press, 1949) p.1.

⁶ D. R. Glendinning, *Potato Introductions and Breeding Up to the 20th Century*. *The New Phytologist*, Volume 94, No. 3, July 1983, p.497.

⁷ D. R. Glendinning, p. 498.

⁸ Redcliffe N. Salaman, p. 2.

⁹ D. R. Glendinning, p. 499.

¹⁰ D. R. Glendinning, p. 499.

¹¹ D. R. Glendinning, p. 497.

¹² D. R. Glendinning, p. 499.

¹³ D. R. Glendinning, p. 500.

¹⁴ D. R. Glendinning, p. 499.

¹⁵ D. R. Glendinning, p. 497.

¹⁶ John Reader, *Potato A History of the Propitious Esculent* (United States: Yale University Press, 2009), 8.

¹⁷ Acharya P. B, Shilpkar P. *Solanum Tuberosum* Supplementation for Biogas Production. *Curr World Environ* 2015; 10(1). Available from: <http://www.cwejournal.org/?p=8351>. doi: <http://dx.doi.org/10.12944/CWE.10.1.35>

¹⁸ Whitener, Dan (Retired owner of Whitener's Nursery, Huntersville, NC) August 2016.

¹⁹ "Incan Economic Development," *Discovery Ed*, Last Modified 2011.

²⁰ Cynthia Graber, "Farming Like the Incas," *Smithsonian Magazine*, Last Modified September 6, 2011.

²¹ Cynthia Graber.

²² "Browse 41,997 Cities Worldwide." Accessed October 2016.
<http://www.weatherbase.com/>

²³ Michael Franco, "Top 5 Ancient Incan Inventions," *How Stuff Works*, <http://science.howstuffworks.com/innovation/inventions/5-ancient-incan-inventions5.htm>.

²⁴ Antoinette Molinie, "*The Resurrection of the Inca: The role of Indian Representations in the Invention of the Peruvian Nation*"; 2004, Taylor and Francis.

²⁵ Nathan Nunn, Nancy Qian, "The Columbian Exchange: A History of Disease, Food, and Ideas," *The Journal of Economic Perspectives*, Volume 24, Number 2, Spring 2010, pp. 163-188(26), doi: <https://doi.org/10.1257/jep.24.2.163>

²⁶ John Doebley, Molecular Evidence and the Evolution of Maize," *Economic Botany* July 1990, Volume 44, [Supplement 3](#), pp 6–27, DOI: 10.1007/BF02860472

²⁷ Julie Thompson [Klein](#), William G. [Doty](#), *Interdisciplinary Studies Today: New Directions for Teaching and Learning*, Number 58, (San Francisco: Josse-Bass, 1994), 58.

Each author is respected both for their degrees and that they are teach at Harvard and Yale respectively. This is a great source for tracing how the potato economically had an impact both in the Old and New Worlds. They also trace disease in both the flora and fauna of the Columbian Exchange. They also give economic perspective to modern day production and consumption of foods, including potatoes.

Bibliography

Acharya P. B, Shilpkar P., *Solanum Tuberosum Supplementation for Biogas Production*. Curr World Environ 2015; 10(1). <http://www.cwejournal.org/?p=8351>. DIO: <http://dx.doi.org/10.12944/CWE.10.1.35>

This article was interesting in that it linked Buffalo dung with the increase of potatoes. Although we don't have Buffalo dung readily available today, I would say that it was much more accessible to the Native Americans. I could not find any research on what type of fertilizer was placed on the Incan potatoes, it make sense to me that this was the practice. This is perhaps a factor in how the world potato production is ordered.

“Browse 41,997 Cities Worldwide.” Accessed October 2016.

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

This webpage is great for gathering raw data regarding cities and their weather.

Doebly, John, “Molecular Evidence and the Evolution of Maize,” *Economic Botany* July 1990, Volume 44, [Supplement 3](#), pp 6–27, DOI: 10.1007/BF02860472

This article is a little on the top end when it comes to content. This would be good for someone who wants background information on where the origins of the genetics to maize comes from. It deals with the domestication of maize as it is a descendent of teosinte (tea) which is native to Mesoamerica. It's a little top heavy on information for some, but for those desiring the genetic background in an article, this is for you.

“Farm to Table and Local Food Movement”, SouthUniversity.edu, last modified, August 12, 2011,

<https://www.southuniversity.edu/whoweare/newsroom/blog/farm-to-table-and-the-local-food-movement-49961>

This particular resource is both online and in periodical form. This periodical does a great job of showing the scope of the farm to table movement. There are many areas that may be new to those who are first researching how prevalent it is, especially recently.

Franco, Michael, “Top 5 Ancient Incan Inventions,” *How Stuff Works*,

<http://science.howstuffworks.com/innovation/inventions/5-ancient-incan-inventions5.htm>.

The TV show, *How Stuff Works* has great national appeal to find out the behind the curtain story. In this website Franco does a great job of taking the reader to a place in their mind where you can imagine some of the feats of ingenuity of the Incans. He also describes cultural processes and uses appropriate language. For instance, he describes the process of freeze drying potatoes and getting what is known as *chuño*.

Graber, Cynthia, "Farming Like the Incas," *Smithsonian Magazine*, Last Modified September 6, 2011.

This is an incredible resource. Cynthia Garber has committed her life to science, environment, justice, and food. She speaks Spanish, Hebrew, and French. She has been awarded numerous times and is continuing to develop her skill through professional development. Here is the link to her webpage where we see what an asset she is to our study. http://www.cynthiagraber.com/home/About_Me.html

Glendinning, D. R., *Potato Introductions and Breeding Up to the 20th Century*. *The New Phytologist*, Volume 94, No. 3, July 1983, p.497

This is a great source for the science within the potato. For those who just want the casual knowledge of the outside of the potato, this is NOT for you. This article is an in depth study of the genetic make-up of several types of plants. It covers the ploidy part of the potato and surveys the value each of the differing potatoes possesses. It also traces the path of the potatoes from the Andes Mountains to Europe and Medio America.

"Incan Economic Development," *Discovery Ed*, Last Modified 2011.

This is a source that is both factual and entertaining. This is a resource from Discovery Ed and is designed for the grades we are focusing on in our CU, and is correctly titled.

Klein, Julie Thompson, Doty, William G. ., *Interdisciplinary Studies Today: New Directions for Teaching and Learning*, Number 58, (San Francisco: Josse-Bass, 1994), 58.

This resource gives validity and documentation to the upside of interdisciplinary studies. These concepts are things we all attempt to do in our classrooms with scholars, and this gives the science behind their findings and our methods.

Malone, Cory, Gray, Sarah, Ross, Sean, Ryan, Katie, "The Columbian Exchange," Accessed September 14, 2016.

<http://public.gettysburg.edu/~tshannon/hist106web/site19/plants.htm>

These four authors did a great job of putting the Columbian Exchange at a level that could be understood, for old and young alike. This would be a great resource for a social studies unit on the Columbian Exchange if you were dealing with the differing plants that were involved. It also covers disease, animals, and technology of the period.

Molinie, Antoinette, "The Resurrection of the Inca: The role of Indian Representations in the Invention of the Peruvian Nation"; 2004, Taylor and Francis.

Although this resource was not one that I relied heavily upon, it was still useful and to the point. It gives an overview of many Incan inventions and how they were one of the greatest cultures to use their modern technology and surroundings to their advantage. This is great for Incan culture.

Nunn, Nathan, Qian, Nancy, “The Columbian Exchange: A History of Disease, Food, and Ideas,” *The Journal of Economic Perspectives*, Volume 24, Number 2, Spring 2010, pp. 163-188(26), DIO: <https://doi.org/10.1257/jep.24.2.163>

This journal article boasts of the research of two great minds. The great thing about this article is that both of the authors have PhDs in economics. Their perspective is to be respected both for their degrees and that they are teach at Harvard and Yale respectively. This is a great source for tracing how the potato economically had an impact both in the Old and New Worlds. They also trace disease in both the flora and fauna of the Columbian Exchange. They also give economic perspective to modern day production and consumption of foods, including potatoes.

Reader, John, *Potato A History of the Propitious Esculent* (United States: Yale University Press, 2009), 8.

This source by Reader is quite eclectic in the varieties that are pictured. I would suggest this source for some of the great pictures found within its covers. Reader does a great job of identifying the domestication of the potato, and gives us a good look into its progression. Reader also addresses some of the hurdles that the Incans had in the high altitudes of the Andes Mountains.

Salaman N. Redcliffe, *The History and Social Influence of the Potato*. (Cambridge, United Kingdom: Cambridge University Press; 1949).

The name Redcliffe Salaman is not synonymous with modern genetics like Gregor Mendel is however, Salaman was doing the same thing with potatoes in London that Mendel did with peas in Austria years before. Even after contracting tuberculosis, Salaman continued his studies that took him nine years to write, and a lifetime to accomplish. This source is a great for combining genetics, history and even archeology.

Whitener, Dan (Retired owner of Whitener’s Nursery, Huntersville, NC) August 2016.

If you have been around Charlotte for the last 60 years and attempted to purchase plant starts in the Huntersville area, you probably know Dan Whitener. Although Whitener’s Nursery is now out of business, Dan Whitener has been a wealth of knowledge for the community and to me. He can tell you the temperatures of when plants bloom, when to harvest, and when they die. He is a wealth of information regarding all things plants. I do not know the exact time that Dan told me all these things, but I know it was recently.
