The Importance of Planning: Science Education from Many Points of View

Kirsten Morgan Edwards

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THE IMPORTANCE OF PLANNING: SCIENCE EDUCATION FROM MANY POINTS OF VIEW

By

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of the Requirements for
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THESIS SUMMARY

The purpose of this thesis project was to bridge the divide between public lands, such as parks, and the education system; national parks and monuments are great resources for education. In addition to promoting outside of the classroom education, this project explores different teaching methods and how changing pedagogical practice can help more students learn in the long term. In order to explore different methods of teaching, I created three different lesson plans that could be used, for example, in places like Congaree National Park, to bring education outside of the traditional school environment. These lesson plans are supplemental materials to a traditional learning environment, but provide a way for students who do not thrive under traditional methods to have a deeper understanding.

In addition, I brought my photography into the lessons as visual aids for learning, which is one of the ways of teaching as well. I have been active in photography for many years, but have had little use for my images of the natural world until this project. It was important for me to create different types of lessons to explore helping different types of learners, and incorporating photography in one lesson really helped this goal.

Finally, this project addresses the importance of national parks and their history to the United States, and how educating students in these environments may increase conservation efforts in the future along with helping create passion for the STEM fields and science education. It is important that young learners have a science education when young that way they don’t shy away from these fields when they are older and ready to make career decisions.
B. Introduction

When I first was introduced to the honors thesis as a freshman at USC I immediately had plans to use photography. I have taken multiple photography courses over the years, and wanted to put my hobby and skills to use. Originally, I planned to use my photography on a microscopic scale and explore biology from an up-close point of view, but after completing a service learning course through the university with Dr. John Grego, my initial plan for a senior thesis was further developed. I wanted to pursue an artistic direction for my own photography around the greater midlands area and at Congaree National park.

The service learning course previously mentioned was also centered at Congaree National Park but included focus on history of the park, species cataloging (iNaturalist) and the governmental and legal history of the area and communities surrounding Congaree National Park. After participating in cataloging some fungi through iNaturalist, an app where anyone can upload pictures and locations of any organisms they see in the wild, I decided this is where my photography can come into play. I could use my images to explain what a species is, and its role in the ecosystem. In addition, after learning about Congaree’s educational center I was set on creating lesson plans using my own photography and donating them to the park for their use.

I have never been one of those people that always knew exactly what they wanted to do as an adult, but I have always had an interest in education. I really enjoy learning and watching other people learn, and grow as they acquire new information. Because of my interest in both art (photography) and education I have always been conflicted about what I personally want to study. I really enjoy incorporating art into science and showing how they can work together.

As almost any project does, mine developed into something quite different than my original plan to show nature through art, into a way to use different methods of teaching in
three unique lesson plans that explore facets of the same topic; food webs and ecosystems. My lesson plans were originally quite long, but I decided since students have limited time at the park, and they definitely want to explore the outdoors, I would create three “mini lessons” at around 30 minutes each. Each lesson plan uses a different approach to learning that will be highlighted later on.

Although my idea transformed over time, the general purpose stayed the same. I want to make a difference through education. I have not always dreamed of being a teacher, or a science teacher since I was a child, but over my years developing passion for science, I have found that I love helping other people understand it too. Watching someone else develop passion and understanding for something you love is a joy unlike any other. I know many teachers who all have different motives for teaching but for all of them, a passion for making a difference and patience are key factors. I have spent many hours over my life caring and teaching children in different settings, and formally creating these lesson plans is a step in the right direction for becoming an educator.

In my goal to become a teacher I have always thought I would want to teach middle or high school students. I have spent a lot of time volunteering with children of preschool age, between 3 to 6 years old, and while I do enjoy my time with them, I think the age where a teacher has the most impact on a student is when they are older and forming their own opinions about the world and how it works. Science really is the explanation of how the world works, so naturally my science background and desire to teach and have an impact go hand in hand. Having the opportunity to help students discover the reasons behind and understanding
of why things happen is really important to me. For this reason, I have more passion for teaching middle or high school students as my career.

The state standards and academic performance indicators are discussed in more detail in each lesson outline along with how the standards are important in achieving learning goals. Below are these outlines of all three lesson plans and explanations of the theory behind them, and of which standards they can help achieve the learning outcomes. In addition, the use of photography is explored further in one lesson, and some history of the park and its learning center is utilized to make connections between today’s education and how the center was used in the past. All three of the lessons are considered supplemental to a classroom lesson on the subject, and it is assumed that students come to the park with background knowledge on the topic, and this is the not the only education they are receiving on each standard.

C. Lesson One

Beginning with the first lesson plan, the Producers, I created a lesson utilizing the idea that students learn best with visual aid. Diagrams and photographs are essential to helping a student succeed in learning and remembering the information because they grow the accurate image that students see in their mind when listening and talking about a subject (Shabiralyani). It has been proven that images help students remember information by creating a single picture that they can recall helping them synthesize information later on. It is important for them to see accurate representations of the topic so they can recall and use these images later to explain and grow their knowledge.

Producers are essential to any ecosystem, as they harness energy from the sun to live and grow. Students in this lesson will learn the basics of energy production through
photosynthesis and what a food chain is and how they are vital parts of an ecosystem. In addition, words and phrases like energy flow, trophic level, and diversity will be introduced as important topics to discuss. The energy produced in plants and organisms is primarily for their function but also can be utilized by other organisms. This means that in turn, the energy is harnessed further down the food chain by consumers and decomposers. Depending on the age level of students participating in this lesson, there can be a lot more technical information included. If the prospective students are high school students, the lesson can focus more on photosynthesis and the products, chemical equations, parts of the cell or parts of the organelle all of which are more relevant to high school biology standards.

For this lesson plan, the activity planned is for the students to draw their own pictures and recognize vocabulary words and how each individual piece works together. A great topic for the drawing would be photosynthesis. Photosynthesis encompasses most of the key points needed to understand the topic of producers. Have each student draw their own interpretation of photosynthesis after you have explained it, and then show them a diagram (picture) explaining photosynthesis correctly, so they can correct their drawings and relate it back to producers in general. Below is a table that outlines the lesson plan for the Producer topic.

For most age groups, the outcomes of this lesson will include a deeper understanding of ecosystems as a whole with a focus on where energy comes from. Most importantly, the students will be able to grasp the concept of a food chain, where the food originates from and how it is made, on a surface level. Students should also be able to discuss the topic among one another to come up with questions that help them understand further. The ability to think
critically about a subject and ask each other questions is an important part of learning new information.

1 Table 1: Lesson Plan Time Guide for Producer Lesson

D. Lesson Two

Second in the array of lessons is information on consumers. The consumer lesson is focused on using physical activity as an educational aid. Physically participating in a lesson really helps students especially of a younger age recall information later on. “How People Learn suggests that learning for understanding requires the organization of knowledge around core concepts”, for this reason the lessons include vocabulary and phrases that are the key points in the lesson. Children can build upon a basic knowledge to create a deeper understanding of a subject.

The principal ideas in the consumer section include how consumers further the flow of energy, levels and types of consumers, and the difference between a food chain and the food web. Important vocabulary includes carnivore, omnivore, herbivore, scavenger, and food web. Students will be able to differentiate between omnivores, herbivores and carnivores along with understanding where their energy comes from. In addition, students will be able to explain the difference between a food chain and a food web. Consumers control the middle of the food chain, from beginning to end. Everything is a consumer except primary producers. One of the most important things students need to understand is that they themselves are consumers, part of the food chain.

1 See Tables and Images Section
The game planned for this lesson is an interactive food web. Personally, I have seen this used in many different subject areas across the board, but it is a perfect game for food web. First each student will pick up a note card or piece of paper with the name of their organism (and/or a number) on it and tape it to their shirt. Students will all line up in a circle and take one step back to create enough area for the game. The facilitator will select the student with the primary producer card (e.g. grass) to hold the yarn to begin. The student will then toss the yarn to the person in the circle next in line (e.g. grass throws to rabbit), if choosing to put numbers on the cards then students will know who is next with less critical thinking (e.g. grass (1) throw to rabbit (2)). Although activities and games like this can be utilized in the more traditional classroom setting, going to places like Congaree can help take these games to the next level. Using the yarn food web outdoors creates opportunities for students to explore the environment around them and find examples of connections between organisms that they are able to see occur right in front of them in the natural world. Having this lesson at the park is designed to take what could be a great lesson at school a step further and become a fun and effective learning experience.

Consumers are vitally important to the food chain, and the overall food web. This lesson will help students learn the levels of consumers and how they interact with one another. After the discussion, the students will be able to discuss and identify which consumers are which (primary, secondary, tertiary/omnivore, herbivore, carnivore), come up with their own questions about the topic, and explain how the organisms all rely on one another for survival.

\[\text{Table 2: Lesson Plan Time Guide for Consumer Lesson}\]

\[\text{2 See Tables and Images Section}\]
E. Lesson Three

Building on the first two lessons, the third introduces the idea of decomposers. The lesson will be a lecture format to demonstrate how effective lecturing versus other forms of teaching can be. It is debatable whether a lesson with guided inquiry versus an expository method is more effective to help students retain information. How Students Learn, a text on theory of education practices explains “Students taught with the ThinkerTools curriculum displayed a deeper conceptual understanding than students taught with a traditional curriculum” (407). ThinkerTools is an inquiry based education curriculum. Therefore, a simple lecture will not be as effective as other forms of teaching, like guided inquiry.

Students learning about decomposers will be able to identify decomposers and their energy sources. The vocabulary important to this lesson includes carbon cycle and the idea of recycled energy. The main component of the lesson is explaining what a decomposer is. Students will be able to explain decomposers and how they recycle energy, and explain the carbon cycle.

In lieu of an activity, this lesson will solely be a lecture style meaning there is no activity to go along with it. Some students are able to process and recall information more effectively from just listening. This lesson will include a worksheet for note taking, and guided questions; Nwagbo states that, “The results showed that the guided inquiry method was significantly better than the expository method in enhancing cognitive achievement in biology for students of all levels of scientific literacy, especially the high ones”. Due to the fact that in some situations questioning students and letting them synthesize information is more effective at helping them understand the topic, we can expect students to actively participate and have
high levels of literacy in the given subject area. Students will take notes while listening to the speaker, and we can compare how effective the lesson was compared to the other lessons where an activity was present. Guided inquiry can be taken outdoors at Congaree National Park while walking trails, or sitting in a clearing you can have students observe what is around them, ask them to talk amongst themselves about what is going on, and ask questions about why certain things happen the way they do. Using the worksheet outdoors during a hike, or during a more Socratic seminar style inquiry session will facilitate communication between students and help them synthesize information on their own.

As part of this lesson, photographs from my own experiences in the park will be shown to the students in poster or PowerPoint format to show what an active decomposer looks like. This can be displayed while the students are completing their worksheets if in classroom, or before a walk through the park. Decomposers are more complicated to explain than consumers especially, because they take on more inconspicuous forms. Decomposers are similar to both consumers, in that they feed on other organisms, and producers, in that they use energy from something else (sun for plants, dead matter for decomposers) so they are more of a gray area. This topic will be particularly challenging for younger students, but is achievable through simplifying the topic. Similar to the first lesson adaptations can be made to alter the age group of interest.

This lesson will provide students with general knowledge about decomposers, and a broad view of different types of decomposers. When students hear the word decomposer their first reaction is usually fungi. Congaree will have many great examples of decomposers in addition to fungi, like earthworms and slime molds that are less common examples, but are
great tools for facilitating the questions that students may have about decomposers. Students will be able to explain why decomposers work the way they do, and how they interact with dead organisms to continue the flow of energy into the cycle (carbon or energy) even when an organism is no longer alive.

3Table 3: Lesson Plan Time Guide for Decomposer Lesson

F. Educational Theory

When researching how the lessons plans will be laid out, I came across two very important sources *How People Learn* and *How Students Learn*. One very important message from *How Students Learn* was that a student comes to the table with many preconceptions about a topic. On the other hand, their own observations make for good evidence to prove a theory or idea to be true. With these points in mind, the three lesson plans were crafted to explore different methods to breaking down these preconceptions, inspiring scientific inquiry, and understanding the subject at hand.

*How People Learn* branches from the ideas mentioned in *How Students Learn* but incorporates it into general knowledge, not only what students in primary and secondary school experience. All three of the methods for teaching that are the focus of each lesson are effective in their own way, and may be better for one type of student over another type of student. Changing up the type of lessons that are present in the classroom, or in this case the park, is a way to show students who are not necessarily successful in traditional models that teachers care that they learn and understand the material as much as they care about other students.

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3 See Tables and Images Section
There are, in general, eight types of learners. As referenced by the Baltimore County Public School system, these learners are Visual learners, Auditory learners, Kinesthetic learners, Tactile learners, Active Learners, Reflective learners, Global Understanding, and Analytical Understanding. This is a simple representation of information pioneered by Howard Gardner at Harvard University in 1983. He calls it the Theory of Multiple Intelligences; he explains methods of teaching, and activities that are more effective for each type of learner. In agreement with him, I concur that in general our culture claims those who are logical and “numbers smart” as intelligent and of high regard. But there are other types of intelligence, for example, musical intelligence, interpersonal intelligence and naturalist intelligent (Gardner). Placing students into individual boxes can be hard, but understanding their general method to learning will help educators most successfully reach every individual in their classroom. These three lesson plans will try and reach a broad range of students through their different lesson styles.

The three activities I have previously mentioned in each individual lesson plan are a drawing activity, a yarn game (physical activity), and an expository question session. These activities may be more suited for different age groups as well. Obviously a 7th or 8th grade student with more background knowledge will perform better in a question and answer led discussion because they are more confident and have more knowledge about the area of science overall. Some more in-depth parts of the lesson are more suited for a Biology I student which would be a 9th or 10th grade student. Overall the three activities are suitable for both young and more experienced learners.

These lessons are aimed at a middle school age student or older, and through reference of state standards 6.L.5, 7.EC.5 and H.B.6, these topics fit into the 6th and 7th grade curriculums.
The lessons can be used for any age group, but under South Carolina state standards it is more appropriate to use them for middle school students to help them achieve learning goals during the year. In the South Carolina State Academic Standards handbook, standard 6.L.5 states “The student will demonstrate an understanding of the structures, processes, and responses that allow protists (single celled organisms), fungi, and plants to survive and reproduce”. This is clearly represented, at least in part, by our decomposer lesson. Standard 7.EC.5 states “The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments”. The relationship between organisms and how they interact is a concept of ecosystems, which is further represented by standard H.B.6; it states, “The student will demonstrate an understanding that ecosystems are complex, interactive systems that include both biological communities and physical components of the environment”. All of these standards have indicators that point an educator in the right direction for their lessons, and while my lessons do not cover all indicators for each standard they represent, they are great supplemental learning materials for a field trip to the park that reiterates things already discussed in class.

The third lesson on decomposers encompasses standard 6.L.5 when explaining the process of decomposition, their structure and types, and their response to other organisms. The indicator for this standard that students will be able to understand and interpret data on how structures of decomposers allow them to obtain energy from their environment is supplemented by this lesson as students learn about the structure of fungi and other decomposers. After students hear the lecture and vocabulary that has to do with decomposers and view the images they can build upon this knowledge and extrapolate how they interact
based on their physical characteristics. The worksheet will help them understand the structure by repetition of the vocabulary, and drawing a picture of a known decomposer.

Both standards 7.EC.5 and H.B.6 encompass the overarching idea of ecosystems and food webs as a whole, including their interactions and how they respond and interact with one another. The producer and the consumers alike both can represent these standards. The standards can be interpreted at different levels of complexity, and at which age group is targeted by that standard. The indicator for the 7.EC.5, that students can develop and use models to describe characteristics of the levels of organization within ecosystems is met when doing the yarn activity. Students learn about the levels of consumer organization by understanding that not all consumers eat plants, and that the food web is more interconnected than just a food chain. The yarn game is a model of a food web that they can use to explain the interactions between all those consumers.

Although the yarn game reaches the surface level of the food web, it can be used to have a deeper understanding of the concept. For example, if playing the game outside, you can ask them questions about what would happen if part of the web was wiped out, physically demonstrate it, and discuss the consequences. The activity can be adapted to go deeper, and help students ask questions and discuss together how small changes to an ecosystem can cause a large wave of reactions, either positive or negative.

Standard H.B.6 includes the conceptual understanding of the carbon cycle, and developing models of the carbon cycle. Both the producer lesson, which includes photosynthesis and our decomposer lesson which includes returning the carbon back to the earth provide information necessary to indicate completion of this standard. After both lessons
students will be able to explain the beginning and end of the carbon cycle, where the carbon comes from (CO2) and how it is returned to the cycle through decomposition. Although we used a worksheet in our lesson, decomposition could easily be taught through something like a biodome project, or composting.

It is important for an educator to have variation in their types of teaching throughout the year, like the variation in my three lessons. Part of the reason I wanted to include different types of lessons was to address the problem in classrooms where a teacher uses one style and some students succeed while others really struggle to find their way. Finding a balance between all different types of learners is difficult, but is possible by changing up the types of lessons and pedagogical approach to lesson planning. In addition, where the time of a lesson is spent reflects what part of the lesson is most important. The three lessons I created are supposed to be supplemental to a traditional classroom lesson on the same topic, therefore most of the time is spent on the activity, not on the lesson, but the activity is where the majority of the learning occurs.

G. Photography

As previously mentioned, I wanted to incorporate my own photography at the park into each lesson plan. I was able to obtain many images that would be useful for my lessons on producers, and decomposers but consumers on the other hand, were quite hard to come by. I spent a lot of time in the park hiking, on many different trails and found that certain areas of the park were preferred by certain species. This helped me find the ones I was missing but also is an important example of ecosystems (and food webs) in the park itself. Decomposers like mushrooms, lichens etc... were more likely to be found in the uplands and bluff areas that were
drier, while insects and producers are everywhere, reptiles and amphibians were more common around the boardwalk in the wetter areas.

Many hikes around the park have led to a large collection of images but although I spent a lot of time searching for primary and secondary consumers, most of the subjects of my pictures are producers (trees, grasses) and decomposers (fungi, lichens). Taking photographs from an artistic point of view almost always contradicts a scientific point of view. From an artistic perspective, the photo needs to have a good composition and evoke some kind of sentiment from the viewer, while scientific images of living subjects are merely a way to document their form and structure. I struggled a bit with balancing my desire to take artistic photos with the need to have photos that display all parts of an organism for identification purposes.

4Image 1: Large Cypress Tree () in Congaree National Park

Photography as a facilitator to learning, can be a great help in student understanding. It has been shown that visual aid is a key role in the recollection of information. For example, when studying for a test a student tries to remember what exactly is a producer, and because they were shown an image they can remember that a plant (e.g. a cypress tree) is a producer, rather than memorize a long, wordy definition. This type of remembering is often related to what type of learner the student is, and is not universal for all students.

5Image 2: Lizard () in Congaree National Park

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4 See Tables and Images Section
5 See Tables and Images Section
The most useful area for my photography to be presented was definitely the decomposer lesson. I have a vast collection of fungi and lichen photographs from the park and these organisms are often the most misunderstood or underrepresented in lessons, and in the student’s background knowledge. It would be useful to have a large poster of one of the mushroom photos printed out to be a visual aid during the decomposer lesson, and to serve as a facilitator for question and answer sessions. The other photographs could be utilized in a power point or presentation as you are teaching each lesson in order to have visuals to help students recognize organisms of each type.

One important aspect of photography, or just capturing organisms through any medium, is identifying the species in the work. Species Identification is something I have explored with my photography in the past, and especially for plants and fungi, is a really difficult process. There are many resources that can be utilized to figure out the species of an organism but it is almost impossible to be one hundred percent sure when identifying organisms that have been known to mimic one another as an evolutionary adaptation. This is especially true with fungi. Although difficult, I have managed to identify the species of all images included in the lessons and labeled them for convenience. Most often, students only need to know common names not scientific names of organisms.

Image 3 and 4: Fungi () in Congaree National Park

H. Park History

The history of the park plays a role in how I decided to create my lessons because they created their education center for a reason. In order to live up to this legacy I explored some

6 See Tables and Images Section
Edwards

history of the park in general. There was a struggle to get the park up and running, because there was a large logging industry that was interested in the large bottomland hardwood forests similar to the land that would later be Congaree National Park. For many years no one was interested in the land, but now Congaree National Park is the largest bottomland hardwood forest in the United States thanks to a small group of people who really advocated for change.

Congaree National Park was founded in 2003 after a long tumultuous history. Originally, CNP was preserved as Congaree Swamp National Monument, not as a National Park, in 1976. The father of Congaree is Harry Hampton; the namesake of the current visitor center, he pioneered the idea of conservation of the land. Interestingly, his motivation for the conservation is not what a lot of people assume. He wanted hunting reforms, and was interested in the land as a source of wildlife management. Although he was not as involved in protection efforts when the legislation finally came through, the local people used his campaign, started in the 1950’s, to preserve the land. The desire to preserve the floodplain was at first resisted by the government, as there was an uproar over contrast between private and public ownership of the land, and what would be a forced sale of the privately-owned land.

Although the land wasn’t protected until 1976, people have been present on the land for many centuries; traces of native American activity in the land dates back to ten-thousand years ago. More recently, in the 1800s people desired to use the land for livestock or farming, and settle down, but they had little success. The land and its properties made logging, living, farming and almost any activity difficult and unprofitable. The Santee River Cypress Lumber Company tried to use the land for its valuable timber, but it was hardly accessible and logging
was only possible at the main, wide rivers making extraction costly, and the whole process unprofitable as well (NPS).

In addition to the possible logging and production on the land, it was owned by the Beidler Family for many years. They held the land in reserve for timber, which as previously mentioned was unprofitable. As the ideas for how to utilize the land were tossed back and forth, the sale to become public land was finally settled upon. Compared to other National Parks and land tracts, Congaree was established fairly quickly (Almlie). The reason the history of the park is an important aspect to education is because without resources like the park, the opportunity to go somewhere untouched and see nature in the “wilderness” would be nearly impossible for a lot of young people.

As a resource for local schools, the Park has a great educational center that can be utilized for class trips or for small groups who wish to learn more about the park, or ecology that can be found within the park. Their education center is most greatly utilized by schools in the surrounding area (Lexington, Columbia, Hopkins etc..), but can be used by other groups such as summer camps, scout groups, University classes, churches, and even companies for team building exercises. It is my hope that lesson plans like mine make a difference in the park and help students learn more about the natural world.

Congaree has utilized curriculums like Project Wild, and references state standards when teaching classes in their education center. Dr. David Shelley pointed out that he is working with some professors at the University of South Carolina School of Education to re-vamp their curriculum and update their teaching. I want to help spread the word and make new
lessons available and by creating this project, everyone I have come in contact with is now aware of these changes, and aware of the education center if they were not previously.

I. Conclusions

Not only did I want to contribute to the parks education center, I wanted to see what I could learn from their model of education. Dr. David Shelley at the park was an invaluable resource to me, and provided me with so many sources of information for this project that I am forever grateful for. Utilizing new types of information and learning all about state standards, the educational field, how to create a lesson plan, understanding different styles of learning and the park history has been a learning process for me.

This project carries significant importance to me, and I hope it can impact the park in some way. The utilization of my lesson plans may be helpful for students and organizations that want to learn more about ecosystems and how they function. Learning about a subject where they can observe evidence of the topic first hand really increases the learning capacity of students. This project really impacted my desires to become a teacher in a positive way.

Throughout this process I have learned more about education and what it means to cater to more than just the majority of students. Many approaches to education cater to just the majority of students and how they learn, not to all students. While this may be appropriate for generating adequate test scores and reports, for the best percentage of students passing, or reaching academic goals we must address all students and all types of learning.

Exploring different methods of teaching is something that more teachers should undertake, especially in the modern world where people are better about communicating their struggles in the traditional classroom setting. Bringing students out to the park to learn also helps increase
their desire to explore the outside more often. Researching these methods has broadened my knowledge of pedagogical practices and helped me in my path to become an educator.

My secondary goal, in addition to teaching students about ecosystems and trophic levels through different methods, is to raise awareness of places like Congaree National Park and what it takes to conserve them. Especially with the way our country is moving politically, we need to help the younger generations value the natural world and choose to pursue the conservation of these places. This can be achieved through putting emphasis on learning in a natural environment and using fun lessons to create a passion for science in the minds of the students. This is the main goal of my project, to teach the students and reach all the different types of learners, while inciting a love for the environment, and the STEM field, overall.
J. Sources


South Carolina Department of Education. (2014). *South Carolina Academic Standards and Performance Indicators for Science*. Mick Zais, Education Oversight Committee, State Board of Education.

Table 1: Lesson Plan Producers

<table>
<thead>
<tr>
<th>Step</th>
<th>Time of Step</th>
<th>Time of Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Introduce Topic</strong>- Producers are the life blood of the world, they harness the sun’s energy to make food, and provide food for other organisms.</td>
<td>2min</td>
<td>2min</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vocabulary</strong>: Food Chain-series of organisms dependent on each other for a food source Producer-an organism capable of producing its own food through a chemical process Energy Flow-transfer of energy from one body or place to another (through the food chain) Photosynthesis-a chemical process used by many producers to synthesize their own food Trophic Level-one level in a hierarchical series of organisms in an ecosystem Diversity-variability of living organisms in the ecosystem Ecosystem-a biological community of organisms and how they interact with each other and their environment</td>
<td>5min</td>
<td>7min</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recap Idea</strong>- give the students some discussion time after going over the vocabulary, let them answer: Why is it important that plants produce sugars from the sun’s energy?</td>
<td>5min</td>
<td>12min</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Activity</strong>- Drawing Photosynthesis</td>
<td>15min</td>
<td>27min</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conclusions</strong>- Producers are the backbone of all ecosystems; they produce the first food source, from the sun’s energy. Answer questions students may have and show pictures of common producers.</td>
<td>3min</td>
<td>30min</td>
</tr>
</tbody>
</table>
### Table 2: Lesson Plan Consumers

<table>
<thead>
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<th>Step</th>
<th>Description</th>
<th>Time of Step</th>
<th>Time of Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Introduce Topic</strong> - What are Consumers and why are they important? Consumers are you and me, they “consume” other organisms to get energy to carry out their needed functions.</td>
<td>2min</td>
<td>2min</td>
</tr>
<tr>
<td>2</td>
<td><strong>Vocabulary</strong>:&lt;br&gt;Consumer - organisms that receive energy by consuming other organisms&lt;br&gt;Scavenger - feeds on dead animal and plant material to gain energy&lt;br&gt;Predator - a hunting organism that kills others for food&lt;br&gt;Prey - the organism that is attacked/killed for food by the predator&lt;br&gt;Carnivore - animal that feeds on other animals solely&lt;br&gt;Omnivore - animal that eats both plants and other animals&lt;br&gt;Herbivore - organism that feeds on only plants for food&lt;br&gt;Food Web - a system of interconnected food chains</td>
<td>5min</td>
<td>7min</td>
</tr>
<tr>
<td>3</td>
<td><strong>Recap Idea</strong> - Ask questions: All organisms are connected by the food chain... How do we assign levels in the food chain? What types of consumers are there? Let them converse for a few minutes.</td>
<td>5min</td>
<td>12min</td>
</tr>
<tr>
<td>4</td>
<td><strong>Activity</strong> - Yarn Game</td>
<td>15min</td>
<td>27min</td>
</tr>
<tr>
<td>5</td>
<td><strong>Conclusions</strong> - Explain how this is all readily visible just outside your front door. Show images of common consumers of different levels (primary consumer, secondary consumer etc.) Answer questions asked in Recap, then answer their questions.</td>
<td>3min</td>
<td>30min</td>
</tr>
</tbody>
</table>
Table 3: Lesson Plan Decomposers

<table>
<thead>
<tr>
<th>Step</th>
<th>Time of Step</th>
<th>Time of Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2min</td>
<td>2min</td>
</tr>
<tr>
<td><strong>Introduce Topic</strong>- Why is this important in everyday life? Decomposers play a vital role in carrying out the energy cycle, and help break down other organisms when they die.</td>
<td>5min</td>
<td>7min</td>
</tr>
<tr>
<td>2</td>
<td>5min</td>
<td>7min</td>
</tr>
<tr>
<td><strong>Vocabulary</strong>- Decomposer-an organism that decomposes organic material Carbon Cycle-processes that convert carbon into the environment (conversion into tissue through photosynthesis, and return to the air through decomposition and respiration) Review: Trophic Level-one level in a hierarchical series of organisms in an ecosystem Ecosystem-a biological community of organisms and how they interact with each other and their environment Food Web-a system of interconnected food chains</td>
<td>7min</td>
<td>9min</td>
</tr>
<tr>
<td>3</td>
<td>5min</td>
<td>12min</td>
</tr>
<tr>
<td><strong>Recap Idea</strong>- explain the carbon cycle while focusing on parts from the other lessons (photosynthesis, and respiration), provide all necessary information for the worksheet (possibly PowerPoint)</td>
<td>10min</td>
<td>22min</td>
</tr>
<tr>
<td>4</td>
<td>15min</td>
<td>27min</td>
</tr>
<tr>
<td><strong>Activity</strong>- View Photos, Give Worksheet and complete it. Let them discuss amongst themselves</td>
<td>10min</td>
<td>27min</td>
</tr>
<tr>
<td>5</td>
<td>3min</td>
<td>30min</td>
</tr>
<tr>
<td><strong>Conclusions</strong>- What is a decomposer? How do they continue the carbon cycle? What is their role in the environment? Answer any questions they may have. Go over worksheet.</td>
<td>10min</td>
<td>30min</td>
</tr>
</tbody>
</table>
Image 1: Upper Bluffs of Congaree National Park

Image 2: Carolina Anole (*Anolis carolinensis*) on Congaree National Park Boardwalk
Image 3: Fungi (Genus Pluteus, unknown species) in the Bluffs of Congaree National Park

Image 4: Shelf Fungi (Trametes versicolor) on a fallen tree in Congaree National Park
DECOMPOSERS WORKSHEET

NAME: __________________________

**Vocabulary**

Decomposer: ____________________________________________________________

Carbon Cycle: __________________________________________________________

Trophic Level: __________________________________________________________

Ecosystem: _____________________________________________________________

Food Web: _____________________________________________________________

**Draw a Picture**

---

**Critical Thinking**

1. What are decomposers?

2. How do decomposers help the environment?

3. Give an example of a decomposer.

4. What role do decomposers play in the food web?