Inside Out Science: Discovering the Scientist Within Me!

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This curriculum unit is recommended for:
K-5 Science

Keywords: science, cells, microscope, scientific thinking, convex, concave, plants, animals, biology

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: This curriculum unit will address scientific discoveries using the scientific method and explore similarities and differences between plant and animal cells. Students will learn how to find the scientists within themselves to explore parts of a plant and parts of an animal. They will use a hands-on approach to conduct scientific experiments, while expanding their natural curiosity of living things. Students will compare how plants and animals look on the outside to digging deeper to explore the hidden mysteries on the inside. My hope is that they will discover science is much more than a textbook or picture from the internet. They will use science labs, scientific notebooks, experience guest speakers and much more! Science is all around them and by digging deeper with scientific questions, they will discover the scientist within themselves!

I plan to teach this unit during the coming year to 23 2nd grade students.

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The Discovery

As an educator, I have discovered that many students and teachers have a common desire to find the answer or solution to just about everything in life. We want to know ***what*** the magical answer is, ***how*** can we get to the magical answer and ***why*** the answer is true. While this concept isn't always a negative thing, it can present a roadblock when working with science. In science, you may find that there sometimes isn't an answer to everything. That's the beauty of science! This unit will lay a foundation for "thinking outside the box" and finding the scientist within ourselves!

The Purpose

Science topics in general create natural curiosity in the minds of our young learners. However, developing questions that lead to scientific discovery can sometimes be difficult. Exploration and fear of the unknown can be scary at times. My students always want to know if they are correct and are doing it the "right way." With science, there isn't always a "right way" and it's okay to make mistakes. I want this unit to give students a firm foundation of the inquiry process and engage in hands on experiments to test their scientific questions about Plants and Animals. They may not always come to the correct answer following an experiment, but they will have the knowledge tools necessary to draw conclusions about their experiment. This seminar will give me the necessary background I need to probe my students' thinking and how I can pose questions to students. I look forward to modeling "thick" or "thin" questions so that students have a deeper meaning with the inquiry process. They will not only look at how to develop questions, but also look at the functions and importance of plants and animals in our environment.

In order for students to grasp the larger picture relating to the function of Plants and Animals, they will first take an in-depth look at *cells*. Cells are the building blocks of all living things and we will explore how cells are all around us. We will compare differences between plant cells and animal cells. *What makes them unique and special? What would our cells look like underneath a microscope?* Students will make a model of their cell with an Animal Cookie Project. Yum! They will take an inside look at various animal groups and develop questions and experiments related to plants and animals in our environment. We will do experiments using vegetable shortening to simulate the insulation of penguins and whales, virtual labs to simulate the function of cells, insect exploration and observation and much more! At the end of this unit, students will explain HOW they are scientists using various forms of writing such as poetry, opinion writing and informational text. This seminar is a perfect bridge in helping me teach science concepts to young learners. Collaboration from this seminar will help my students look within themselves to discover how science is all around them, and most importantly how it is within THEM!

Demographics

J.H Gunn Elementary School is a Title 1 public school serving students K-5. The school itself has great history as it once began as four-room school frame called Clear Creek Colored Union High School in 1923. It has evolved through the years with changes in principals, students and building structure, but still retains the original gym as part of its rich history. The school has a population of 719 students, with 86% of students who qualify for free and reduced lunch. Within our subgroups our student background is 49% African American, 33% Hispanic, 14% White and 4% Asian.

Our principal firmly believes that quality instruction and uninterrupted instructional time are the keys to building student success. Our school motto, "Where Children Come First!" encourages the academic, physical, and social development of every student.

Our school serves students with physical, emotional and mental special needs as part of our Inclusion Program. Students also have opportunities for enrichment through our Talent and Development Program, English as a Second Language Program, Girls on the Run, Student Government, Basketball and Cheerleading. This school has been an integral part of our community and school system for more than 80 years.

I am a 2nd grade teacher at J.H. Gunn and have also taught Kindergarten and 3rd grade. I teach a wonderful group of students who come from various backgrounds and are on diverse academic levels. Some students come to me with very little home support, while others have support from mothers, fathers, aunts, uncles, etc. Some students come to third grade already reading on grade level, while others come in reading on grade levels that

are 1-2 years behind. I collaborate with my fellow 3rd grade teammates as well as staff to create lessons that meet the needs of all my students. I use professional development such as Discovery Education training, Investigations Math Training and Common Core training to enhance knowledge and growth in my classroom. Discovery Education training was a huge support in finding science and social studies videos correlated to Common Core Standards. Common Core Standards are new to the state of North Carolina. Therefore, extensive training has been offered to give teachers a better understanding of how they can prepare students to be global learners.

Science Content Objectives *(Refer to* Appendix 1*: Teaching Standards for further details):*

Essential Standard: 2.L.1 Understand animal life cycles

Clarifying Objective:

2.L.1.1 Summarize the life cycle of animals including: birth, developing into an adult, reproducing, aging and death

2.L.1.2 Compare life cycles of different animals such as, but not limited to, mealworms, ladybugs, crickets, guppies or frogs.

Unpacking: What does this standard mean that a student will know and be able to do?

2.L.1.1 Students know that animals experience a cycle of life which begins with birth, then a period of time in which the animal develops into an adult.

At adulthood, animals reproduce in order to sustain their species. In nature, all animals are programmed to age and eventually die. The details of the life cycle are different for specific animals.

2.L.1.2 Students know that different animals spend varying periods of time in each stage of the life cycle and that some animals have few stages, while others have several. Students know that animals might look the same, similar, or completely different at specific stages of development. Students know that animals may have varied needs at different stages of development, and may occupy unique habitats according to these needs.

Content Research

Before starting this unit, it is important for teachers to have a firm foundation of content and background knowledge to teach students. One critical component of this unit is the function of microscopes and how they work. You look through the lens and see what it on the slide, right?! Although this concept may seem simple at first, there are several scientific discoveries that can be made from digging deeper, such as optics, reflection, refraction, concave, convex, etc. This information will help teachers explain to students ***why*** objects are magnified under a microscope. There are 4 major types of microscopes that will help you decide which one best meets the needs of your students.

Types of Microscopes

Light Microscope - the models found in most schools, use compound lenses to magnify objects. The lenses bend or refract light to make the object beneath them appear closer. Common magnifications: 40x, 100x, 400x

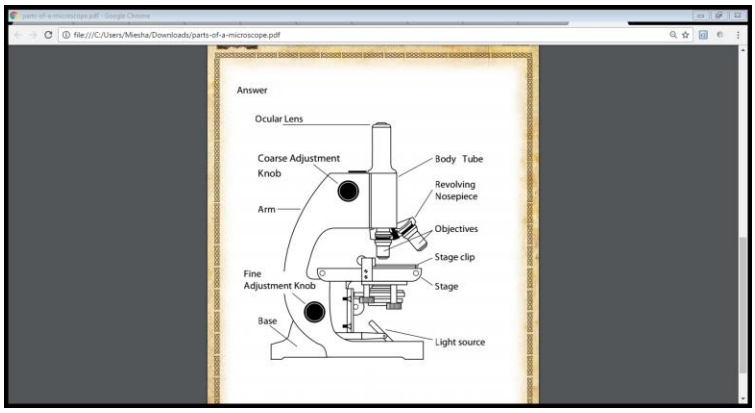
Stereoscope - this microscope allows for binocular (two eyes) viewing of larger specimens.

Scanning Electron Microscope - allow scientists to view a universe too small to be seen with a light microscope. SEMs do not use light waves; they use electrons (negatively charged electrical particles) to magnify objects up to two million times.

Transmission Electron Microscope - also uses electrons, but instead of scanning the surface (as with SEM's) electrons are passed through very thin specimens.

Before having students explore with microscopes, it may be best to have them explore first with magnifying glasses. This will give student an idea of what a microscope looks like on the inside. Most magnifying glasses are made of convex lenses, which bend the light inward. They converge or focus the light and create an image. The opposite of convex is concave. With concave glasses, the lenses spread out light rays. Most magnifying glasses use a bi-convex lens, which means it has two convex lenses on both sides. They curve outward to form a dome.

Once students have a clear understanding of magnifying glasses, they are ready to explore with microscopes!



How does a microscope work?

1. The microscope rests securely on a stand on a table.
2. Daylight from the room (or from a bright lamp) shines in at the bottom.
3. The light rays hit an angled mirror and change direction, traveling straight up toward the specimen. The mirror pivots. You can adjust it to capture more light and alter the brightness of the image you see.
4. The light rays pass through a hole in an adjustable horizontal platform called the **stage**.
5. The stage moves up and down when you turn a thumb wheel on the side of the microscope. By raising and lowering the stage, you move the lenses closer to or further away from the object you're examining, adjusting the focus of the image you see.
6. To look at something under a microscope (such as a plant leaf), you prepare a specimen of it. The specimen has to be a very thin slice so light rays will pass through.[i]

Optics and Reflection/Refraction

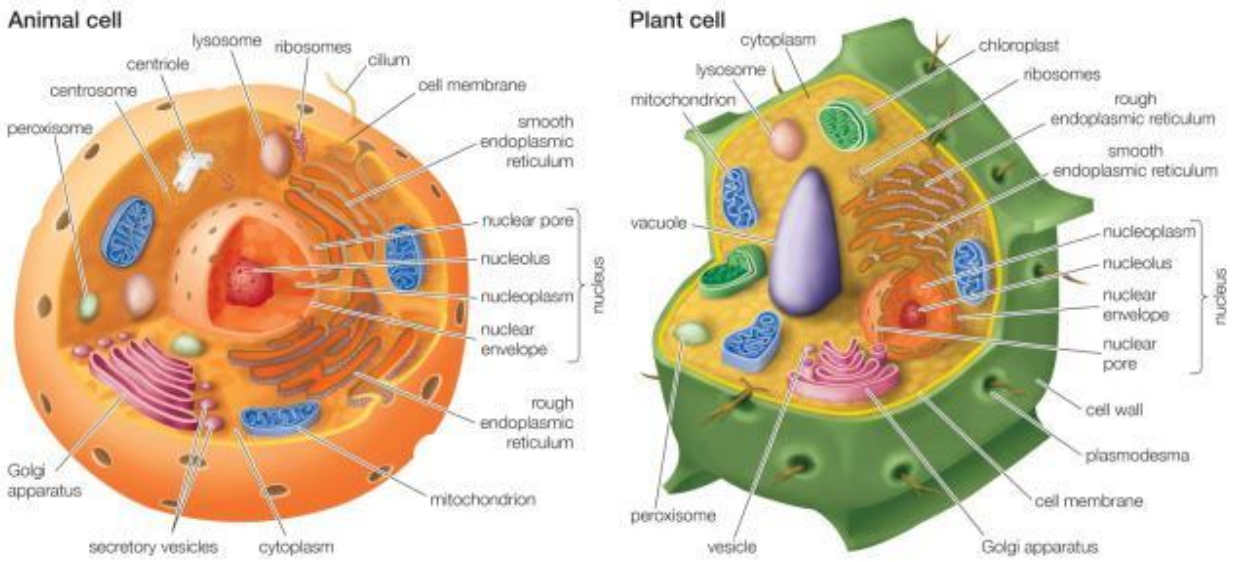
Light is a form of energy that travels in waves. Light performs in four major ways including reflection, refraction, diffraction and interference. The first two ways serve as good background information for teachers, even though students at this age may or may not experience the exact vocabulary. *Reflection* occurs when light bounces back, producing an image. One example of reflection is how we see ourselves in the mirror or how we see our reflection in a river or lake on a sunny day. *Refraction* occurs when light

waves bend, because it travels at a different speed in different materials. The lenses on eyeglasses refract light, helping people to see objects better. Other examples of refracting lenses include: telescopes, binoculars, camcorders and microscopes.

Plant and Animal Cells

There are several similarities and differences between plant and animal cells. Since this unit will target both types, it is important to note the differences between the two. To help students understand what cells are, show them lots of examples of cells and explain to them that we are not able to see cells with our normal eyesight, but can see them with microscopes. Our human body is filled with millions of cells. Cells are the building blocks of matter and ALL living things are made of cells. Animal cells are round in shape and do not have a cell wall, while plants cells are rectangular in shape. Below is a chart showing common differences between plant and animal cells. Overall, animal cells are typically smaller in size than plant cells.

Animal Cells	**Similarities**	**Plant Cells**
Does not have a cell wall	Both have cytoplasm	Does have a cell wall ****This is an easy way to distinguish between plant and animal cells under a microscope.**
Has smaller vacuoles than plant cells	Both have ribosomes	Has one large central vacuole that takes up 90% of cell volume.
Does not have chloroplasts	Both have mitochondria	Does have chloroplasts, which are needed for photosynthesis.
	Both have a nucleus. They are both known as eukaryotic cells, which mean they have a true nucleus. The opposite of eukaryotic cells is prokaryotic cells such as bacteria.	
	They both have a similar process for reproduction, including mitosis and meiosis.	



Background Knowledge/Helpful Hints

Creating a survey or questionnaire before starting a unit provides helpful background information on students as well as their comfort level for science. There are several questions teachers must also ask themselves about how they learned science growing up and how science is taught now. If you are someone who had science fears growing up in the classroom, what were some of the challenges you faced? Reflecting on our challenges will help us understand how our students learn science and shape their viewpoint about science. One way to get a glimpse of student thoughts is by having students take a Science Survey. Below are suggested survey questions that can be used at the beginning of the year. The complete survey can be found in the Appendix (Appendix 3).

1. Science is fun.
2. I like to do science experiments.
3. Science is confusing.
4. My favorite part about science is _____.
5. My least favorite part about science is _____.

Vocabulary

Throughout this unit students will have exposure to vocabulary terms they will need working with science tools such as microscopes, magnifying glasses, science notebooks, etc. They will organize their vocabulary in their science notebooks by creating vocabulary foldables. This tool is a great interactive reference for any subject because it allows students to build on their previous knowledge as they learn new information throughout the unit.

Strategies

The anticipated timeline for this unit is 3-5 weeks. The first week will be spent on discovering the basics of science. *What is a scientist? What skills are needed? What is Lab Safety? How can I stay safe?* The second week will be on how we use science in everything we do. Science is everywhere….in math, where we solve problems; in daily observations from nature; etc. The next week will be spent on learning foundations of all living things: cells. We will use microscopes to observe and record what cells look like and the basic functions of each cell part (nucleus, cell membrane, mitochondria, etc). The third week will explore how combined cells create different plants and animals. We will compare and contrast animal features and their life cycles. The final 2 weeks will be spent on individual and group projects, ending with the culminating activity of presenting animal research projects.

I would like to arrange students in a variety of ways from independent reflection to small group jigsaw. When students work independently on their animal research, I would like them to choose an area of the classroom they feel they work best and use various forms of technology to help them gather information. The science and technology tools need to be easily accessible in tubs or containers. This helps students explain their thinking and work through research in multiple ways. Once students have an opportunity to work on their independent research, I would like students to work with partners and groups to share and compare information.

Jigsaw

With small group jigsaw, I would like students to work together to share lab notes and science models. Small group jigsaw gives students an opportunity to bounce ideas back and forth off each other as well as teach others their strategies. Students begin by working in small groups where they research a specific plant or animal. To incorporate reading and writing skills, students will develop a nonfiction book to share with their classmates. Their nonfiction book will include: Table of Contents, diagrams, pictures, headings, etc.

Once students develop their book, they will switch groups to learn about other animals their classmates researched. For example, if there are 4 groups, one person from each group will rotate to a new group as the "expert." The "expert" will share their thoughts and ideas with other members of the new group and ask for feedback. *Are there any questions we could add to help us research? Can you make any connections to what you researched?* Using this strategy not only helps students practice their communication skills, but gives them an opportunity to teach others their new information.

Interactive Science Journals

This strategy provides a concrete way for students to track their thinking. For this unit, I want to use Science Journals to record science vocabulary by having students create interactive foldables. They will fold paper into four equal quadrants and write their vocabulary word, definition and example. I also would like to use the journals to discover any fears or concerns my students may have about science. For example, when students complete an activity, I will use the journals as a reflection piece for them to write how they feel about the lesson. The "Fist to Five" tool is a great strategy to check in with students on their level of understanding. Students can simply write the number in the top right corner on how they feel about the lesson.

Fist to Five Tool

1	I don't understand at all.
2	I need to go over this again.
3	I think I get it but I'm not completely comfortable.
4	I get it.
5	I get it and can explain it to someone else.

Centers

There are many aspects to Science where students can reinforce previous skills and engage in enrichment activities. I will have four different rotating centers set up in the classroom that correspond to student multiple intelligences, which will include: Verbal Linguistic, Kinesthetic, Visual Spatial and Technology. These centers will be introduced at the beginning of the unit so that all students understand expectations and activities. Students at the **Technology** station will use the computer and SMART board to listen to science exploration videos from Brain Pop, Discovery Education and StudyJams. They will use the interactive simulation tools to try out science scenarios following the guided

instruction. For the **Visual Spatial** learners, students will create giant cells on butcher paper to show their knowledge of cell parts. For **Verbal Linguistic,** students will use iPADs to record Lab Safety Tips. Before recording, they will write their steps in sequential order and verbally walk their lab partner through the steps. Once they have an opportunity to receive feedback, they will record their final steps on the Ipad using iMovie. For **Kinesthetic** Learners, they will explore hands on by testing various objects under a microscope and collect data through group surveys. All scientists will have opportunities to work collaboratively or individually and record their information in their science journal to be kept throughout the unit.

Rubrics/Surveys

Rubrics are extremely helpful in focusing on a specific skill or task. Rubrics give students a guideline to what is expected of them and helps me as a teacher evaluate and assess whether they understand. For example, if the goal or purpose of the assignment is Working Cooperatively with a group, a rubric can be used to assess this. Students would receive a 4 if they participated and respected the ideas of others 90-100% of the time. They would receive a 3 if they participated and respected the ideas of others 70-80% of the time. They would receive a 2 if they participated and respected the ideas of others 60-70% of the time, etc. Surveys will also be used to get an idea of student interest and self-assessment. Students will rate themselves on how well they completed a task or performance skill. They will reflect using their survey and in their response journals.

Cooperative Grouping

This is another strategy I would like to use with this unit so students can share ideas and learn how to work together. When placing students in groups, it is helpful to assign task jobs for each student to hold them accountable for their own learning. Some examples of task jobs include: Director, Reader, Materials Manager, and Data Recorder. (NSTA Cooperative Grouping)
Director or Taskmaster—Encourages each group member to participate and perform his or her jobs. The director may also read directions or word problems, notify the teacher of group problems or questions, and monitor the time.
Materials Manager—Gathers all necessary materials for the group. Ensures that all members are taking care of materials and using them properly, and that the work area is cleaned by all members of the group at the end of the activity.
Data Recorder—Writes ideas on a group paper once members have reached a consensus. They check for accuracy. They may also act as group reporter if needed. Students will rotate their task jobs during different plays and dramatic practices to get an opportunity to experience each task.

Activities

Week One: Scientific Lab Safety (Basic Lab Safety using our Five Senses)

In order to lay a firm foundation of science concepts, students need to have knowledge of basic lab safety as it relates to using our five senses: Sight, Touch, Taste, Hearing, Smell. Students are often eager to engage in science experiments, but it is important to know the risks and precautions when doing all experiments. Students will create a 5 Senses Lab Safety Foldable by dividing their paper into sixths and labeling each section with one of the five senses (one section will be blank for the title-See Appendix 2).

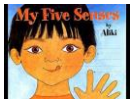
- **Sight** (Flap One) Always wear safety goggles when working with chemicals to protect your eyes
- **Taste** (Flap Two) Never taste science materials/ Do not eat when working on a science experiment.
- **Smell** (Flap Three) Never place your nose directly near chemicals. Use the "wafting" technique where you gently wave the smell towards your nose with your hands.
- **Touch** (Flap Four) Always wear gloves when working with extreme temperatures.
- **Hearing** (Flap Five) Always listen for instructions from your lab coach or teacher.

After introducing each flap of lab safety, it is important to practice and give examples on how to use it when conducting lab experiments.

Good resources to use to teach about the Five Senses include:

- Study Jams (this interactive website has videos and activities for all five senses)

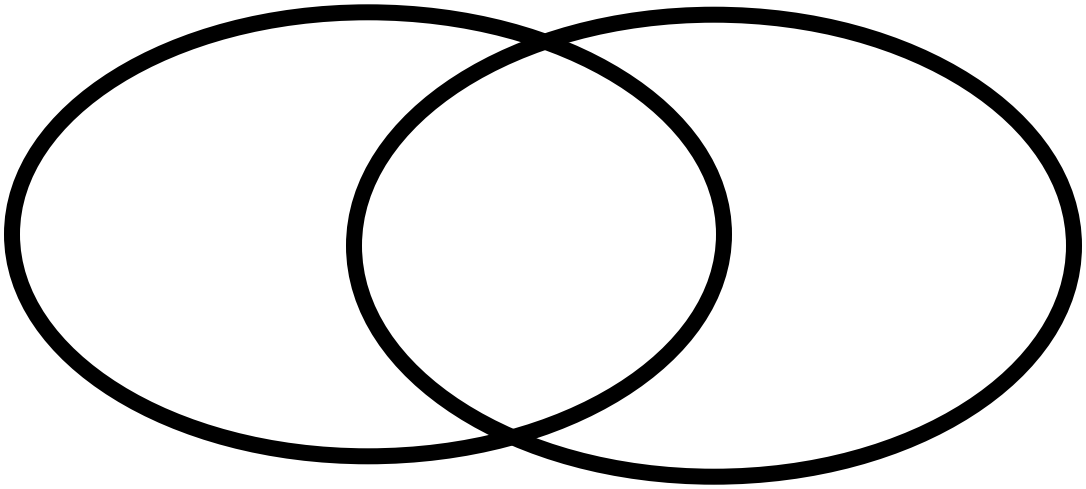
http://studyjams.scholastic.com/studyjams/jams/science/human-body/seeing.htm



***My Five Senses* by Aliki**

Week Two: Science All Around Us (nature walks/ scavenger hunts around the school)

Students will work in lab partners and use their Ipads to explore the world around them. They will discuss the differences between living and nonliving things and take pictures of 3-5 things from each category. Each lab pair will use a jar or sandwich bag to collect one living sample and one nonliving sample. Once students return to their classroom, they will use their five senses and a Venn Diagram to compare and contrast features of living and nonliving things.



*Week Three: Microscopic Research (*observing plant and animal cells under the microscope*)*

- Students will draw and label parts of a microscope to gather information on the function of each part. They will complete their drawings in their lab notebooks, labeling each specific piece (*Reading Connection: Using charts and diagrams in nonfiction text helps readers gain more information on how things work*).
- Students will use microscopes to look at plant and animal cells such as: potato slices, onion slices and cheek samples.
    - Students will record their results in their science lab notebook. Questions to consider during observations:
        - What color was your cell sample?
        - Do you notice any shapes or patterns in your cell?
        - What happens when you adjust the knob of your microscope? Does it appear larger or smaller?

Activity 1: Cell Detective

Materials:

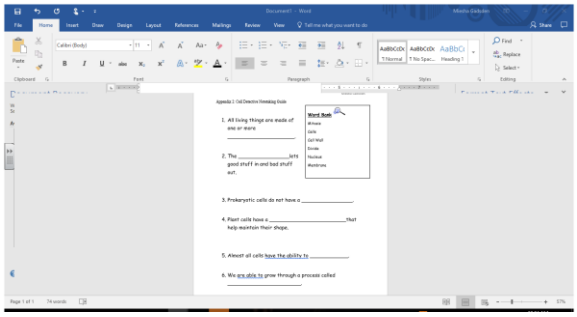
- Student Recording Sheet
- Internet Access:
- https://www.brainpop.com/science/cellularlifeandgenetics/cells/
- https://askabiologist.asu.edu/games-and-simulations
- http://www.sheppardsoftware.com/health/anatomy/cell/index.htm
-

Key Questions:

What are the basic parts of a cell?

Are we made of cells? How do you know?

Students will explore with digital technology tools to gain a better understanding of cells. The first video is from Brain Pop and students will use the Cell Detective comprehension guide to gain background information on cells (see Appendix 3).



Activity 2: Parts of a Cell

Materials:

- Butcher Paper
- Markers
- Cell Templates (plant and animals)

Key Questions:

How can I use my knowledge to work cooperatively with my team members?

What are the basic parts of a cell?

Directions/Setup

Students will work in cooperative learning teams to make a giant plant or animal cell. Using the cooperative learning strategy, each team member will decide on their job descriptions (recorder, time keeper, materials manager and director). Each plant or animal cell must include the following:

- Nucleus
- Cell membrane
- Mitochondria
- Cytoplasm

Students must draw and label each part of their cell on butcher paper. They will also include a write description on index cards to describe the function of each part.

Activity 3: "Cell"-abration!!

Materials:

- Food Materials to make cell
- Licorice or twizzlers
- Vanilla Frosting
- Jellybeans
- Sugar cookies (oval and rectangular shaped)
- Graham Crackers

1. Label your paper plate with your group name and cell type (animal or plant).

2. If you are making an animal cell, use an oval sugar cookie. If you are making a plant cell, use a graham cracker or rectangular shaped sugar cookie.

3. Spread vanilla frosting evenly over the cookie or graham cracker. This will represent the cytoplasm.

4. Add your components to your cell such as the nucleus, mitochondria, cell membrane, etc. and use your science notebook to explain the function of each.

Remember not to eat your cell design until it has been checked!

Analysis Questions for Cell Cookie Project

1. How does your model cell compare to real cells?
2. How do cell parts work together like a team?
3. Why are models helpful when learning about cells? (Literacy Connection: Why are illustrations helpful as text features when reading?)
4. What would happen if one part of the cell was missing?

Activity 4: Plant and Animal Research (Outside)- Cumulative Assessment

Materials:

- Computers
- Plant and Animal Books/ www.pebblego.com website (kid friendly website for research)
- Groups (2 groups will focus on plants and 2 groups will focus on animals)
- Cooperative Learning Chart

Purpose: Use research to discover how animals and plants function and compare their outside features to inside features (previous exploration with cells and how they look inside plants and animals).

1. Students will work in teams to research a plant or animal. They will use their notetaking guide or graphic organizer to find 3-5 important facts, key vocabulary words and 1 illustration or diagram. This information will be used to form their nonfiction book on plants and animals.
2. Students will spend 2-3 days collecting information and notes before starting their nonfiction book. Each nonfiction book should include the following:
    a. Title Page/Cover Page
    b. Table of Contents
    c. 3 headings/chapters
    d. 1 diagram or illustration
    e. Glossary
3. Students will be assessed on their ability to work in Learning Teams as well as their ability to construct their own Nonfiction Text Feature Book.

How Science is Done
Miesha Gadsden

Learning Teams Rubric

Your teacher will use this rubric to evaluate your group's work as a team.

Task: With your group, use your creativity to design a car using everyday classroom and home objects.

	Beginning 1 point	**Developing 2 points**	**Accomplished 3 points**	**Exemplary 4 points**
Contribution	One or more members do not contribute.	All members contribute, but some contribute more than others.	All members contribute equally.	All members contribute equally, and some even contribute more than was required.
Work Product	Members do not complete work and/or do not show creativity.	Members work well together to complete minimal work that shows some creativity.	Members work well together to complete good quality work that shows some creativity.	All members work well together to complete excellent quality work that shows high creativity.
On task	Team needs frequent teacher reminders to get on task.	Team is on task some of the time. Needs teacher reminders.	Team is on task most of the time. Does not need any teacher reminders.	Team is on task all of the time. Does not need any teacher reminders.
Communication	Members need frequent teacher intervention to listen to each other and speak to each other appropriately.	Members need some teacher intervention to be able to listen to each other and speak to each other appropriately.	All members listen to each other and speak to each other in equal amounts.	Each member listens well to other members. Each member speaks in friendly and encouraging tones.

Total points: _____
Teacher's Comments:
_____
_____

Appendix 1: Implementing Teaching Standards

2.L.1.1 Structures and Functions of Living Organisms

Summarize the life cycle of animals including:

• Birth
• Developing into an adult
• Reproducing
• Aging and death

Students will research and examine animals to see how they grow and change in each stage of development.

2.L.1.2 Structures and Functions of Living Organisms

Compare life cycles of different animals such as, but not limited to, mealworms, ladybugs, crickets, guppies or frogs.

2.L.2 Structures and Functions of Living Organisms

Remember that organisms differ from or are similar to their parents based on the characteristics of the organism.

2.L.2.1 Structures and Functions of Living Organisms

Identify ways in which plants and animals closely resemble their parents in observed appearance and ways they are different. Students will make comparisons between plant and animal cells using a microscope.

2.L.2.2 Structures and Functions of Living Organisms

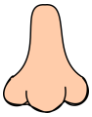
Recognize that there is variation among individuals that are related.

CCSS.ELA-LITERACY.W.2.2
Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.

CCSS.ELA-LITERACY.W.2.7
Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

CCSS.ELA-LITERACY.W.2.8
Recall information from experiences or gather information from provided sources to answer a question.

Appendix 2: 5 Senses Flip Book

5 Senses Safety **Name_____**	**Sight** 
Taste 	**Touch** 
Smell 	**Hear** 

Appendix 3: Cell Detective Notetaking Guide

Use with BrainPop video on Cells*

Word Bank 

Mitosis

Cells

Cell Wall

Divide

Nucleus

Membrane

1. All living things are made of one or more _____.

2. The _____lets good stuff in and bad stuff out.

3. Prokaryotic cells do not have a _____.

4. Plant cells have a _____that help maintain their shape.

5. Almost all cells have the ability to _____.

6. We are able to grow through a process called _____.

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Kelley, Mark Richard. *DNA Repair in Cancer Therapy: Molecular Targets and Clinical Applications*. Amstrerdam: Elsevier/Academic Press, 2012.

This book offers helpful background information for teachers, concentrating specifically on how cells develop and how they can be modified for cancer research.

"Microscopes - BrainPOP." BrainPOP. Accessed October 10, 2016. https://www.brainpop.com/technology/scienceandindustry/microscopes/.

This website offers student friendly background information on microscopes. It is mainly suited for grades 3-8. This site also offers activity pages as well as question guides to accompany the video.

"Plant Life." : DNA in Plants. Accessed June 8, 2016. http://lifeofplant.blogspot.com/2011/04/dna-in-plants.html.

Stille, Darlene R. *Plant Cells: The Building Blocks of Plants*. Minneapolis, MN: Compass Point Books, 2006.

"Strawberry DNA - Food Science - The Lab." The Lab. Accessed June 12, 2016. http://www.stevespanglerscience.com/lab/experiments/strawberry-dna/.

This website explores creativity with food to model how to make plant and animal cells.

Thomas, Lewis, Lewis Thomas, Lewis Thomas, and Lewis Thomas. *A Long Line of Cells: Collected Essays*. New York: Book-of-th-Month Club, 1990.

This collection of essays provide background information for teachers who would like to learn more about cells.

"What's Inside a Plant Cell? on Crayola.com." Crayola.com. Accessed October 18, 2016. http://www.crayola.com/lesson-plans/whats-inside-a-plant-cell-lesson-plan/.

This activity center has both plants and animal cells for young students to explore and label. Since it is on the Crayola website, they encourage use of bright colors and different colors for each part of the cell.

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End Notes

[i] http://www.explainthatstuff.com/microscopes.html

[ii] Biology.com (About Education website)