Elementary Science Unit Plan

Unit Author: Lauren Mazzotta

Unit Title: Exploring the Wondrous World inside of Our Solar System

Grade Level: Fourth Grade

Subject Areas: Science, Language Arts, Mathematics, Art and Technology

Approximate Time Needed: 5 Days (One day per lesson)

Unit Summary:

In the "What is Beyond Our Earth?" lesson, students will learn that there is a large solar system that exists beyond our Earth, Moon and Sun. They will understand that there are seven other planets, besides Earth, that travel in specific paths around the Sun. In addition to the planets, there are other celestial objects in the Solar System including asteroids, meteors and comets. They will learn the characteristics of these celestial objects and understand that they travel in regular and predictable motions. In the ""Let's Land our Spacecraft on the Different Planets!" lesson, students will learn that there are eight planets that orbit around the Sun. They will understand that planets' orbits are slightly elliptical and gravity keeps them in orbit around the Sun. The planets' distances from the Sun place them in the following order: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Mercury's dayside is extremely hot due to the Sun, but at night its temperatures drop hundreds of degrees below freezing. Venus is a planet made up of powerful heat and volcanic activity. Earth is an ocean planet; its water and life makes it extremely unique to our Solar System. Mars is made up of cold deserts. Jupiter is the largest planet in our Solar System. It has dozens of moons and a massive magnetic field. The planet has massive storms such as the Great Red Spot, which has erupted for hundreds of years. Saturn is unique among the planets because of its large, complicated ringlets. Uranus is the only giant planet whose equator is almost at a right angle to its orbit. Its methane gives Uranus its blue tint. Neptune is dark, cold and thrashed by supersonic winds. It is 30 times farther from the Sun than Earth and it takes almost 165 Earth years to orbit our Sun.

In the "Our Dizzy Planet" lesson, students will learn that the time needed for a planet to make one complete rotation is called the planet's day and the time needed for the planet to make one complete revolution around the Sun is called the planet's year. All planets revolve in a counterclockwise direction around the Sun. The Earth makes one complete

rotation every 24 hours. The Earth makes one complete revolution around the Sun every 365 ¼ days. Earth's rotation and the revolution cause it to have seasons. In the "Feeling Hot Hot Hot! - Discovering the Wonders of the Sun" lesson, students will learn that the Sun is a star. They will understand that the Sun is a huge ball of extremely hot gases (e.g. hydrogen and helium). They will learn that a star (our Sun) is formed from a nebula. When a star no longer has fuel it dies because the inside force that burns the fuel is not equal to the gravity pushing on it from the outside. After this happens, it becomes a Red Giant. Next, the Sun will turn into a White Dwarf. A White Dwarf is a star that is about the size of the earth. After its life as a White Dwarf, the Sun becomes a Black Dwarf. A Black Dwarf is what is left of the White Dwarf after it cools. They will comprehend that the Sun's life cycle takes place over billions of years. In "The Moon's Many Faces" lesson, students will understand that the Moon does not give off its own light; instead, it reflects light from the Sun. They will learn that the Moon is undergoing the New Moon phase when its side, that faces the Earth, is not illuminated. The Moon is undergoing the Waxing Crescent phase when part of it starts to become visible. This "lunar sliver" can be viewed each evening for a few minutes after sunset. The Moon is undergoing the First Quarter phase is when ½ of it is visible during the first half of the evening. The Moon is undergoing the Waxing Gibbous phase when most of it is visible. During this phase, the entire Moon is illuminated besides a small sliver and the Moon remains in the sky most of the night. The Moon is undergoing the Full Moon phase when observers can view its entire face. The Moon is undergoing the Waning Gibbous phase when observers can see all of it but a sliver. The Moon is undergoing the Third Quarter phase when observers can see exactly ½ of its illuminated surface. The Moon is undergoing the Waning Crescent phase when observers on Earth can only see a small sliver of it, and this sliver is only visible before morning.

Unit Foundation:

Curriculum-Framing Questions (Inquiry):

- **Essential Question:** How does our Solar System work?

- **Lesson Content Questions:**
    1. What components make up our Solar System?
    2. What are the names and characteristics of the planets in our Solar System?
    3. How does the Earth's orbit around the Sun affect our planet?
    4. What is the lifecycle of the Sun?
    5. Why does the Moon seem to change shape?

Targeted Standards and Benchmarks:

New York State Core Curriculum Standards
Elementary Science: Grades K-4

Standard 4: The Physical Setting
1.1a Natural cycles and patterns include:

- Earth spinning around once every 24 hours (rotation), resulting in day and night
- Earth moving in a path around the Sun (revolution), resulting in one Earth year
- The appearance of the Moon changing as it moves in a path around Earth to complete a single cycle

1.1c The Sun and other stars appear to move in a recognizable pattern both daily and seasonally.

Intermediate Level Science: Grades 5-8

Standard 4: The Physical Setting
1.1a Earth's Sun is an average-sized star. The Sun is more than a million times greater in volume than Earth.

1.1b Other stars are like the Sun but are so far away that they look like points of light. Distances between stars are vast compared to distances within our solar system.

1.1c The Sun and the planets that revolve around it are the major bodies in the solar system. Other members include comets, moons, and asteroids. Earth's orbit is nearly circular.

1.1d Gravity is the force that keeps planets in orbit around the Sun and the Moon in orbit around the Earth.

1.1e Most objects in the solar system have a regular and predictable motion. These motions explain such phenomena as a day, a year, phases of the Moon, eclipses, tides, meteor showers, and comets.

1.1g Moons are seen by reflected light. Our Moon orbits Earth, while Earth orbits the Sun. The Moon's phases as observed from Earth are the result of seeing different portions of the lighted area of the Moon's surface. The phases repeat in a cyclic pattern in about one month.

1.1h The apparent motions of the Sun, Moon, planets, and stars across the sky can be explained by Earth's rotation and revolution. Earth's rotation causes the length of one day to be approximately 24 hours. This rotation also causes the Sun and Moon to appear to rise along the eastern horizon and to set along the western horizon. Earth's revolution around the Sun defines the length of the year as 365 1/4 days.

1.1i The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth. The length of daylight varies depending on latitude and season.

National Science Teachers Association (NSTA) Standards

- 2, 3, 4, 5, 6

Association for Childhood Education International (ACEI) Standards

- 1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2

Student Objectives/Learning Outcomes:

- **The student will be able to:**

Learning Outcomes To successfully complete the unit, the student will……	New York State Standard	NSTA Standard	ACEI Standard	Assessment
Identify the different components that make up the Solar System (e.g. planets, Sun, Moons, comets, meteors and asteroids)	5-8: 1.1c	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion (recorded on checklist) and Exit Card
Identify that most objects in the Solar System have a regular and predictable motion	K-4: 1.1a, 1.1c 5-8: 1.1c, 1.1e	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion (recorded on checklist) and Exit Card
List the names of the eight planets in order according to their distance away from the Sun	5-8: 1.1c	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion and science notebooks
Distinguish two characteristics of each planet	5-8: 1.1c, 1.1d, 1.1e	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion and science notebooks
Determine that Earth's rotation around the Sun results in day and night	K-4: 1.1a 5-8: 1.1h	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion (recorded on checklist) and homework assignment using science notebooks
Determine that Earth's revolution around the Sun results in one	K-4: 1.1a 5-8: 1.1h,	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4,	Whole group discussion (recorded on

Earth year and is the cause of our different seasons	1.1i		5, 5.2	checklist) and homework assignment using science notebooks
Comprehend that the Earth's Sun is an average-sized star	5-8: 1.1a, 1.1b	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion and evaluation of "flip-book" activity
Identify the life cycle of the Sun (medium stars)	5-8: 1.1a, 1.1b	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Whole group discussion and evaluation of "flip-book" activity
Recall why moon phases are seen from Earth	K-4: 1.1a 5-8: 1.1g, 1.1h	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Review science notebooks and response on activity sheets, and Exit Card
Identify that the Moon's phases occur in a cyclic pattern	5-8: 1.1g	2,3,4,5,6	1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4, 5, 5.2	Review science notebooks and response on activity sheets, and Exit Card

Unit Overview:

- **Prerequisites:** Before beginning this unit, students will know that we live on the planet Earth and that life thrives on Earth because of our Sun and water supply. They will know that the Earth has one Moon and that there are other planets that exist in our Solar System. Students will know what a star is and understand that particular stars form constellations in the sky.

- **Key Lessons**:

1 "What is Beyond Our Earth?" - Students will learn what exists past Earth, besides the Sun and Moon. They will learn about the eight planets, comets, meteors and asteroids.

2. "Let's Land our Spacecraft on the Different Planets!"- Students will "take a tour" of each planet, learning about its characteristics and location relative to the Sun.

3. "Our 'Dizzy' Planet"- Students will learn about Earth's orbit. They will learn the difference between a rotation and revolution and will understand the affects that these motions have on Earth.

4. "Feeling Hot Hot Hot! - Discovering the Wonders of the Sun"- Students will learn that the Sun is a star. They will be able to list characteristics of stars and will be able to illustrate the life cycle of the Sun (medium stars).

5. “The Moon’s Many Faces”- Students will learn that the Moon reflects light from the Sun. They will understand why we see Moon phases on Earth and will be able to explain the relationship between the Moon’s phases and its position in regards to Earth.

* Lesson plans are attached

Applied Content Areas:

- Language Arts has been applied to lessons because students will read texts on different aspects of the Solar System, write questions and observations in their science notebooks, and create a story explaining a trip to the Solar System in order to further their understanding of the scientific concepts relayed throughout these lessons.
- Mathematics activities have been integrated into certain lessons to help students extend their learning and to build coherence across subject areas. Students will solve division problems to determine how many rotations and revolutions Earth makes in certain periods of time and will complete a fraction sheet that asks them to determine what fraction of the Moon is visible during each of its eight phases.
- Also, in order to integrate technology into lessons, students will complete research on celestial concepts using Netbooks. In addition, certain learning activities will be conducted on the classroom Smart Board.
- Art has been applied within this unit plan. Students will be given the option to draw pictures, along with their written responses, in order to communicate their thinking. Furthermore, one of the lessons contains an activity that will require students to create a flipbook that will portray the lifecycle of the Sun. This activity will have students illustrate their learning through pictures.

Key Terms / Vocabulary:

Solar System, celestial, planet, meteor, comets, asteroids, planetoids, orbit, rotation, revolution, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, rotation, revolution, axis, orbit, gravity, force, craters, greenhouse effect, Great Red Spot, magnetic field, hydrogen, helium, methane, rotation, revolution, orbit, axis, hemispheres, counterclockwise, Sun, medium stars, nebula, plasma, force, gravity, hydrogen, helium, Red Giant, White Dwarf, Black Dwarf, Moon, craters, reflection, orbit, waxing, waning, cyclic, New Moon, Waxing Crescent, First Quarter Moon, Waxing Gibbous, Full Moon, Waning Gibbous, Third Quarter Moon, Waning Crescent

Assessment Plan:

- A KWL chart will be used to activate students' prior understanding. It will help them brainstorm ideas and think about questions to explore. After learning, it will promote metacognitive skills as students return to the charts and reflect on their learning and new understandings.

- Notebooks entries will be used to have students illustrate their learning. In their science notebooks, students will explain their understanding of new scientific concepts and pose questions that they have on certain material. The teacher will collect students' notebooks to assess their mastery level of the lesson's learning objectives.

- Exit Cards will be implemented at the end of lessons to assess each individual student's understanding. The questions on the Exits Cards will be directly related to the learning objectives of that lesson. Students will write their answers on the card provided.

- The teacher will engage students in whole group discussions throughout each lesson. These discussions will allow students to ask questions, listen to the thinking of others, and orally communicate their own thinking. During this time, the teacher will use a checklist to mark down each student's understanding level based on their questions and comments.

- Students will complete a homework assignment that asks them to respond to a quote about scientific concepts. This assignment will ask students to list important pieces of information gained from class to support their responses. Students will write this information in their science notebooks and the teacher will collect their notebooks for evaluation during the next day of class.

- Ongoing assessment will also occur during these lessons when the teacher reviews students' responses to different activities completed during exploration. The teacher will evaluate pieces created by students to assess their understandings of the learning objectives.

- At the conclusion of this Solar System Unit, the teacher will administer a unit test that includes multiple choice, true/false, and short essay questions to assess students' overall understanding of the key scientific concepts relayed throughout this unit.

Differentiation Strategies:

- Students will work with partners to complete assignments
- Enlarged versions of texts will provided to students with visual impairments
- Texts will be provided on audio for students with special needs and/or for students who struggle with reading
- Students will work in cooperative learning groups with assigned roles (based on their individual

strengths)

- Assistive devices will be implemented into lessons such as speech-to-text tools (e.g. Kurzweil 3000) and head-pointing systems for students with special needs
- Adapted versions of the text will be provided to accelerated students and to students with special needs
- Students will be allowed to draw pictures, along with their writing, to demonstrate their thinking
- Students will orally communicate their understanding during discussions

Materials and Resources:

"Our Solar System" by: Seymour Simon, "Space Leftovers—A Book About Comets, Asteroids, and Meteoroids" by: Dana Meachen Rau, "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, Internet Safety Contract, highlighters, Smart Board, science journals, science notebooks, pens, pencils, lined paper, poster board, markers, crayons, scissors, Netbooks, Exit Cards, http://ofcn.org/cyber.serv/academy/ace/sci/cecsci/cecsci067.html, http://www.youtube.com/watch?v=GQbPwf3OH68, http://solarsystem.nasa.gov/planets/, blacktop, yellow ball, colorful balloons, chalk, planet signs, NASA articles, computer, checklists, http://www.kidsknowit.com/educational-songs/play-educational-song.php?song=Why%20Do%20We%20Have%20Seasons, https://docs.google.com/a/share.brevardschools.org/file/d/0B5--VfTZqLfuNmFkMDI1ZWMtZTcwOS00NmI2LTk5NjItZjA3YWU4YmI0MjRk/edit?hl=en_US&pli=1, yellow ball, inflatable globe, lamp, star sticker, http://teachers.net/lessons/posts/3861.html, "The Young Oxford Book of Astronomy" by: Simon Mitton and Jacqueline Mitton, heavy white paper, sample flipbook, colored pencils, erasers, stapler, http://www.kidsastronomy.com/astroskymap/lunar.htm, "The Moon Seems to Change" by: Franklyn M. Branley, Oreo cookies, plastic spoons, Activity Sheets, http://stardate.org/nightsky/moon#cs_phases%20of%20the%20moon, http://www.schoolfamily.com/print-and-use-tools/document/1152-internet-safety-contract

Reflection: Attached to the end of this unit

Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science

"What is Beyond Our Earth?"

Grade 4

Learning Objective Goals:

1. Students will identify the different components that make up the Solar System (e.g. planets, Sun, Moons, comets, meteors and asteroids).
2. Students will identify that most objects in the solar system have a regular and predictable motion.

Science Standards

- Science as Inquiry
- Science, Reading, and Writing
- Earth Science
  - Celestial Bodies Include Sun, Planets, Moons, Comets, Meteors, and Asteroids
  - Celestial Bodies have orbit in a regular and predictable motions
- Learning Science by Collaboration
- Safety
- Learning Science through Technology

New York State Core Curriculum Standards

Reading Standards for Informational Text: Grade 4

1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.
3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a Grade 4 topic or subject area.

Writing Standards: Grade 4

3. Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally.
b. Use dialogue and description to develop experiences and events or show the responses of characters to situations.
c. Use a variety of transitional words and phrases to manage the sequence of events.
d. Use concrete words and phrases and sensory details to convey experiences and events precisely.
e. Provide a conclusion that follows from the narrated experiences or events.

Science Ideas:

- There is a large Solar System that exists beyond our Earth, Moon and Sun.
- There are seven other planets, besides Earth, that travel in specific paths around the Sun.
- In addition to the planets, there are other celestial objects in the Solar System including asteroids, meteors and comets. These celestial objects also travel in regular and predictable motions.
- Asteroids, often called planetoids, are rock-like material that reflects light, like planets do, and travels around the Sun in something called "the belt of asteroids".
- Meteors are other types of celestial rocks and are found within the path through which the Earth travels as it orbits the Sun. Meteors burn when entering the Earth's atmosphere because of the force of friction (creating what individuals call "shooting stars").
- Comets move around the Sun in long, oval shaped orbits. They are celestial bodies that are composed of small rocks, dust, and frozen gases. When a comet nears the Sun, it appears to have a "tail" because its frozen gases turn into vapor.

Resources: "Our Solar System" by: Seymour Simon, "Space Leftovers—A Book About Comets, Asteroids, and Meteoroids" by: Dana Meachen Rau, "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, http://www.schoolfamily.com/print-and-use-tools/document/1152-internet-safety-contract

Safety Procedures: After giving the directions for the observation homework assignment, the teacher will explain to students that they cannot go outside to observe the night sky unless they have an adult present with them for supervision. The teacher will explain that they can gather the same observations from turning the lights off in their bedroom and looking at the night sky through their windows. This will prevent students from going outside in the dark alone and will keep them sheltered from any harsh weather conditions. Also, when students are creating their posters, the teacher will model the proper way to hold and walk around the classroom with scissors. Sharp objects provide some safety concerns so the teacher will also carefully monitor each group when they are completing their tasks.

Differentiation Strategies:

- Students will be put into cooperative learning groups. These groups will be heterogeneous and mixed in ethnicity, ability level, and gender. To differentiate learning profile, these mixed ability groups will provide opportunities for peer mentoring and peer mediation. Higher performing students will help lower performing students grasp and organize the material. This will also benefit the high performing students because they can deepen their own understandings by helping others.
- To further differentiate learning profile, students will be assigned roles, within their cooperative groups, based on their individual strengths.
- To differentiate readiness, during the elaboration activity students will be allowed to use their notes to compose their writing pieces on their Netbooks, this will especially help students who struggle with organizing their thinking. Also, using Netbooks will benefit students who have physical disabilities that cause them to

struggle with writing. Students may use assistive devices such as head-pointing systems and speech-to-text tools to help them type their writing pieces.

- Students will be allowed to look up additional information on the specific topics within their writing. This will further challenge higher performing students by having them extend their learning.

Procedures

Engagement

The day before the teacher begins this lesson, he or she will assign a homework assignment. He or she will say to students: "Some of you may have looked up at the night sky and wondered what exists beyond our planet. For your science homework, I want you to observe the night sky tonight, before bed, and list anything that you see or any questions that you might have in your science journals. These observations will introduce our science lesson tomorrow!" The next day when students are presenting their observations, the teacher will construct a "KWL Chart" on the Smart Board. The teacher will use students' observations and questions to fill out the "What do we know?" and "What do we want to know?" columns. This will help command students' interests about the topic that is going to be explored.

Some questions students might have or should be asking themselves in order to lead them into exploration of the topic might be:

- How many planets are there?
- What are shooting stars?
- What other objects are in our Solar System?
- Do all celestial objects move?

Exploration

- Students will work in cooperative learning groups that consist of 4 students. Each student in the group will be assigned a role: Director, Materials Manager, Speaker or Group Harmonizer. The director will make sure that each member of the team understands and assists in completing the task. The materials manager will be in charge of collecting and returning all materials used during the activity. The speaker will ask

the teacher to help the group, when needed, and will report the group's findings to the class. The group harmonizer will make sure that there are no "put-downs" and that all group members remain positive to one another.

- Each group will be assigned a topic: comets, asteroids, meteors, or planets. Each group will be presented with pages that discuss information on their topic. These pages will be taken from "Our Solar System" by: Seymour Simon, and "Space Leftovers—A Book About Comets, Asteroids, and Meteoroids" by: Dana Meachen Rau.
- Groups will work together to read through these resources and to highlight important pieces of information. During this "Jig-Saw Activity", they must describe their celestial object(s)'s key characteristics, motion and any other material that they wish to include. They must also create pictures/diagrams that complement the information they are displaying.
- Students then will put the facts and visuals on a poster board so that they can present their product to the class when each group has completed the assignment.
- When each group presents their poster, they will teach their new knowledge to each of the other groups. Students from the other groups will record the important pieces of information that they have learned into their science notebooks.
- Each poster will be hung around the classroom to help celebrate the class' "Solar System Week".

Materials: photo-copied pages from Our Solar System" by: Seymour Simon, and "Space Leftovers—A Book About Comets, Asteroids, and Meteoroids" by: Dana Meachen Rau, highlighters, Smart Board, science journals, science notebooks, pens, pencils, lined paper, poster board, markers, crayons, scissors, Netbooks, Internet Safety Contract, Exit Card

Explanation

After each group presents their material, the class will have a whole group discussion on the new information that students have learned. Students will raise their hands to add new facts to the "What have I learned?" column on the class' "KWL Chart". During this time, the teacher will also ask students certain questions that will help engage them in higher order thinking skills. These questions will be used to help students justify their explanations.

These questions would include:

- What are some physical characteristics of celestial objects? Why do you think they are made out of these materials?
- What similarities did you notice about celestial objects' path of motion? Can you give me an example using two different objects?
- What differences did you notice about these celestial objects, if any?
- Are there paths of motion regular and predictable or are they irregular and random? How do you know?
- Why do you think comets appear to have a "tail" when they near the sun?

Vocabulary: Solar System, celestial, planet, meteor, comets, asteroids, planetoids, orbit, rotation, revolution

Elaboration

In order for students to organize their thinking and assimilate the information learned from this lesson, the teacher will have students type a story, on their Netbooks, pretending that they were exploring the Solar System in a spacecraft with an "extraterrestrial friend". In this story, they must list some of the celestial objects that they might see on their journey and incorporate at least 8 facts regarding these different objects using information gained from the "Jig-Saw Activity" and whole group discussion. Before beginning this extension activity, the teacher will introduce new vocabulary words such as rotation, orbit, and Hailey's Comet and challenge students to accurately integrate these terms into their writing. Students may look back at their notes if they need support when writing. Additionally, more accelerated students will be encouraged to research more information on specific topics if they wish to do so.
(Internet Safety Contract is attached to the end of this lesson)

Evaluation

- Ongoing informal assessment will occur throughout this lesson.

- While groups are completing their assignments, the teacher will walk around the classroom and monitor each group. During this time, the teacher will take a mental note of which students are struggling with the material.
- Additionally, during group presentations and the whole group discussion, the teacher will have a checklist and mark off which students have met the learning objectives and which students need extra practice with material.
- Also, at the conclusion of the lesson, the teacher will have students complete an "Exit Card" that will ask them to list the different elements that make up the Solar System along with at least one fact about each element. This card will also ask students to write two brief sentences describing the types of motions that these celestial objects move through. This "Exit Card" will help the teacher assess each individual student's understanding and will allow him or her to adjust his or her instruction accordingly.

Name: _____ Date: _____

Exit Card

Directions: Today in class we discussed different elements that can be found within our Solar System. Identify these celestial objects and list one fact for each. Also, write two brief sentences explaining how these objects move.

Internet Safety Contract

I _____ promise to obey all house rules about using the Internet.

- I will not bend the rules about which websites I may visit.
- I will follow the rules about how long I'm allowed to stay online.
- I will never open an email attachment from someone I don't know or click on a web link or pop-up.
- I will never download anything from the Internet without first asking permission.
- I will never share my name, address, or telephone number or the name of my school. If anyone asks me for this information, I will tell my parents or another adult I trust.
- I will never tell anyone other than my parents my password. Not even my best friend.
- I will never post my picture or a video of myself online without permission.
- I will never lie about my age online.
- I will not reply to anyone online who makes me feel uncomfortable or angry.
- I will tell my parents or another adult I trust if anyone online asks to meet me in person.
- I will get up from the computer right away and tell my parents or another trusted adult if I see something that scares me or makes me feel uncomfortable.
- I will be respectful to other people online. I won't pick fights or use mean words.
- If someone is mean to me online or hurts my feelings, I will tell my parents or another trusted adult right away.
- I will show my parents how to use my favorite sites, so we can explore them together.

Source: http://www.schoolfamily.com/print-and-use-tools/document/1152-internet-safety-contract

Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science

"Let's Land our Spacecraft on the Different Planets!"

Grade 4

Learning Objective Goals:

1. Students will list the names of the eight planets in order according to their distance away from the Sun.
2. Students will distinguish two characteristics of each planet.

Science Standards

- Science as Inquiry
- Science, Reading, and Writing
- Earth Science
  - There are eight planets and they have regular and predictable orbits
  - Each planet is made up of different elements and has certain characteristics
  - Gravity is the force that keeps planets in orbit around the Sun
- Learning Science by Collaboration
- Learning Science through Technology
- Safety

New York State Core Curriculum Standards

Reading Standards for Informational Text: Grade 4

1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.
3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a Grade 4 topic or subject area.

Writing Standards: Grade 4

2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

   b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

   c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).

   d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

Science Ideas:

- Students will learn that there are eight planets that orbit around the Sun. Along with the Sun, these eight planets are major members of the Solar System.
- Planets are a lot smaller than the Sun and they do not produce their own light. They shine by reflecting the light of the Sun.
- Planets' orbits are slightly elliptical therefore they move closer and farther from the Sun at different points in their orbit.
- Gravity, a strong force, keeps the planets in orbit around the Sun.
- The planets' distances from the Sun place them in the following order: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
- Planets rotate (spin) around a figurative "axis" that runs from the north and south poles of each planet.

- Each planet's revolution (complete orbit around the Sun) period differs from each other. The farthest planets from the Sun have the longest revolutions and the closest planets to the Sun have the shortest revolutions.
- Mercury is only slightly bigger than Earth's Moon. It has very little atmosphere to stop impacts so it is covered with craters. Mercury's dayside is extremely hot due to the Sun, but at night its temperatures drop hundreds of degrees below freezing.
- Venus is a planet made up of powerful heat and volcanic activity. It is similar to Earth's size and structure. Below its clouds, Venus is composed of volcanoes and deformed mountains. Its thick atmosphere traps heat creating a "greenhouse effect." Venus rotates slowly and in the opposite direction of most planets.
- Earth is an ocean planet; its water and life makes it extremely unique to our Solar System. Mars is made up of cold deserts. It is about half of Earth and has the same amount of dry land. However, its atmosphere is too thin for liquid water to exist for long periods of time.
- Jupiter is the largest planet in our Solar System. It has dozens of moons and a massive magnetic field. The planet has massive storms such as the Great Red Spot, which has erupted for hundreds of years.
- Saturn is unique among the planets because of its large, complicated ringlets. Saturn is mostly a gigantic ball of hydrogen and helium.
- Uranus is the only giant planet whose equator is almost at a right angle to its orbit. Its methane gives Uranus its blue tint.
- Neptune is dark, cold and thrashed by supersonic winds. It is 30 times farther from the Sun than Earth and it takes almost 165 Earth years to orbit our Sun.

Resources: "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, http://ofcn.org/cyber.serv/academy/ace/sci/cecsci/cecsci067.html, http://www.youtube.com/watch?v=GQbPwf3OH68, http://solarsystem.nasa.gov/planets/

Safety Procedures: Students must be carefully monitored on the blacktop. The teacher will make sure that the whole class stays together and remain within the fenced in area. The teacher will also model the proper way to "spin" when orbiting. The teacher will make

sure that his or her students do not try to spin too quickly, causing possible health concerns or injuries. Students will be told that if they act inappropriately during this fun interactive activity, they will be asked to sit out and they only will be able to watch their peers.

Differentiation Strategies:

- Cooperative learning will occur during the Elaboration activity. During cooperative learning, students will have the opportunity to learn from each other. Higher performing students can assist lower performing students in order to create a peer-tutoring system. This will serve as differentiation of learning profile because some students learn best by working with others. This will also benefit auditory learners.
- In order to differentiate readiness and process, the teacher can adapt the NASA articles. Grade-level texts are often too simple for some students but too complex for others. Therefore, accelerated learners will be given more advanced versions of the NASA articles. Similarly, students who struggle with reading and comprehension will be given a slightly simpler version of the same sections to ensure that their reading abilities don't obstruct their understandings.
- In addition, to ensure that all students will be able to take part in the demonstration during the Exploration activity, students with physical disabilities will be assigned to play the important role of the Sun!

Procedures

Engagement

As a "hook" activity, the teacher will show students a short clip on the planets in the Solar System. Before viewing this video, the teacher will say: "Some of you may have read books on the Solar System or seen pictures of the different planets. Before our activity, I want you to watch this video about the planets in our solar system and pay special attention to the planets' sizes and physical characteristics. I want you to mark down anything interesting that you see in your science journals."

Source: http://www.youtube.com/watch?v=GQbPwf3OH68

Some questions students might have or should be asking themselves in order to lead them into exploration of the topic might be:

- What is the biggest planet?
- What is the smallest planet?
- Why don't people live on any of the other planets besides Earth?
- Do the other planets have days and nights like we do?
- Why are the planets all different colors?

Exploration

- Students will go outside to the blacktop on the playground to complete this activity.
- On this blacktop, the teacher will already have eight orbits planned out with chalk.
- One student will hold a yellow ball and stand in the center of these orbits. This student will act as the Sun.
- Eight students will be asked to serve as each of the planets. They will wear a sign that tells the rest of the class what planet they are pretending to be.
- The teacher will help these students position themselves on their correct pathways before they begin to "revolve" around the Sun. The teacher will tell students that they must stay on the path that he or she has drawn for them.
- The teacher will model what revolving around the Sun looks like.
- After students begin "revolving," the teacher will ask the students who are observing this demonstration what their classmates should do in order to add "rotation" into their orbits.
- Once a student is prompted to answer this question, the "planets" must add spinning into their path in order to illustrate rotation (the teacher will caution them against becoming dizzy).
- After the first group finishes their demonstration, the teacher will let the other half of the class try. However, this new group of students does not have to stay on their clear pathways. This will pave the way for future discussion and critical thinking.

Source: http://ofcn.org/cyber.serv/academy/ace/sci/cecsci/cecsci067.html

** The first group of students who observe this demonstration will draw the planets and the paths of their orbits in their science notebooks. They will label their drawings and base their work off of the life-sized diagram that their classmates have created. When the other group gets a turn to act as the planets, the preexisting "planets" will take the time to add these same drawings to their science notebooks.

Materials: computer, science journals, blacktop, one yellow ball, eight colorful balloons (colors correspond to the color of each planet), chalk to mark orbits, planet signs, NASA articles, poster boards, highlighters, markers

Explanation

After the second group finishes their demonstration, the teacher will have the whole class sit in a circle on the blacktop for discussion. During this whole group discussion, the teacher will ask students questions in order to engage them in higher order thinking skills:

- Think about our demonstrations, what would happen if the planets did not have specific orbits around the sun?
- What way would a planet be facing during its "daytime?" What way would a planet be facing during its "nighttime?"
- Would each planet's year be the same amount of time as Earth? How do you know?
- What planets would have the shortest years? What planets would have the longest years?"
- What type of force do you think holds the planets in their orbits?

Vocabulary: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, rotation, revolution, axis, orbit, gravity, force, craters, greenhouse effect, Great Red Spot, magnetic field, hydrogen, helium, methane

Elaboration

- In order for students to organize their thinking and summarize what they have learned during this lesson, the teacher will bring students back into the classroom for a "gallery walk activity."
- First, the teacher will have students sit in their seats. They will work in cooperative learning groups of 3 students to read a short paragraph about one of the planets, taken from NASA's website. After groups highlight the important details, the teacher will have each student stand up for an interactive activity.
- The teacher will have blank poster boards hung on various walls of the classroom that are titled with the name of each planet.
- Each group will begin with the poster board of the planet that they were assigned to read about. They will be given markers to write information that they have learned about that planet (they must use information gained from the outside demonstrations along with facts from the NASA article).
- The teacher will give each group three minutes to write down any information that they choose. Then the teacher will yell "switch" and each group will have to move to the next poster.
- The new group will read the last group's comments (to learn more about that planet's characteristics) and can add any additional information that they remember from the demonstration. They also will be encouraged to write down questions.
- After each group has visited each of the posters, the class will review them altogether. During this time, both the teacher and the cooperative learning groups will have the opportunity to answer questions about the specific planets. This will be a very engaging activity that will help students extend and deepen their understanding of the material.

NASA Link: http://solarsystem.nasa.gov/planets/

Evaluation

- Informal and on-going assessment will occur during this lesson when students are completing the demonstrations and "gallery walk" activity. During this time, the teacher will use the answers to discussion questions to note which students seem to grasp the material.

- In order to incorporate an explicit form of instruction, the teacher will have students write in their science notebooks. The teacher will ask students to list the planets in order (according to their distance from the Sun) and have them identify one characteristic of each planet, assessing both learning objectives.
- The teacher will then collect students' science notebooks at the end of the lesson in order to review their answers to both prompts. The teacher will mark down which students need additional instruction on the material and will use this information to make decisions about the need for further instruction on the topic.

Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science

"Our Dizzy Planet"

Grade 4

Learning Objective Goals:

1. Students will determine that Earth's rotation around the Sun results in day and night.
2. Students will determine that Earth's revolution around the Sun results in one Earth year and is the cause of our different seasons.

Science Standards

- Science as Inquiry
- Science, Reading, Mathematics and Writing
- Earth Science
  - Natural cycles and patterns include Earth's rotation and Earth's revolution
  - The tilt of Earth's axis of rotation and the revolution of Earth around the Sun cause seasons on Earth.
- Learning Science by Collaboration
- Safety
- Learning Science through Technology

New York State Core Curriculum Standards

Writing Standards: Grade 4

2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

Grade 4: Mathematics Common Core Standards

Operations & Algebraic Thinking

2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity.

Science Ideas:

- The time needed for a planet to make one complete rotation is called the planet's day and the time needed for the planet to make one complete revolution around the Sun is called the planet's year.
- All planets revolve in a counterclockwise direction around the Sun.
- The Earth makes one complete rotation every 24 hours.
- The Earth makes one complete revolution around the Sun every 365 ¼ days.
- Earth sits on a tilt when completing its elliptical orbit around the Sun. Therefore, as the Earth orbits, there are certain times that the Earth is closer to the Sun. That hemisphere of the Earth undergoes summer whereas the other hemisphere that points away from the Sun undergoes winter.
- Earth's rotation and revolution cause it to have seasons.

Resources: "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, http://www.kidsknowit.com/educational-songs/play-educational-song.php?song=Why%20Do%20We%20Have%20Seasons, https://docs.google.com/a/share.brevardschools.org/file/d/0B5--VfTZqLfuNmFkMDI1ZWMtZTcwOS00NmI2LTk5NjItZjA3YWU4YmI0MjRk/edit?hl=en_US&pli=1

Safety Procedures: During this lesson, the teacher will take all safety precautions necessary. During the Exploration demonstrations, the teacher will model the proper way to rotate and revolve to avoid students from moving too quickly and injuring themselves. All objects will be moved away from the center of the room so students will have a nice clear space to move around. Also, during this time, the teacher will carefully monitor each student and make sure that no "roughness" occurs. When the teacher turn the lights off to simulate daytime and nighttime, the teacher will tell students that he or she wants them to remain seated so they do not hurt themselves when trying to move around. The teacher will also make sure that the lamp's cord is in a safe place and that all students are a safe distance away from the lamp's light bulb. Light bulbs can be very hot and since the lampshade will be removed from the lamp, the teacher must ensure that students do not burn themselves. The teacher will be the only person allowed to hold the lamp throughout this entire lesson.

Differentiation Strategies:

- This lesson differentiates learning profiles because students who struggle with reading and writing will have the opportunity to demonstrate and orally communicate their understanding of the material during the demonstration and discussion. This lesson also challenges higher performing students because the critical thinking questions engage students in higher order thinking.
- This lesson differentiates readiness because students will be allowed to work with a partner during the elaboration activity. Lower performing students will learn from higher performing students, creating a type of peer-tutoring system. Also, all students will deepen their understanding of the material because collaboration encourages students to discuss, evaluate and analyze each other's problem solving strategies.

Procedures

Engagement

In order to draw students' interest into the topic and activate their prior knowledge, the teacher will play the "Why Do We Have Seasons?" song from KidsKnowIt's Educational Music Player This song prompts students to begin thinking about the reasons for the change in weather and why the amounts of daylight change during different seasons. After students listen

to this song, the teacher will ask students to answer two sets of questions in their science journals: “What is Earth’s rotation? What affects does rotation have on our planet?” and “What is Earth’s revolution? What affects does revolution have on our planet?” During this time, students will begin actively thinking about the topic.
Source: http://www.kidsknowit.com/educational-songs/play-educational-song.php?song=Why%20Do%20We%20Have%20Seasons

Some questions students might have or should be asking themselves in order to lead them into exploration of the topic might be:

- What is the difference between rotation and revolution?
- Why do some areas of the world expect summer while other areas expect winter at that time?
- Why is there a longer period of daylight during the summer?
- Do all areas of the world have seasons?

Exploration

- The teacher will have students sit in a big circle on the floor. The teacher will set up a lamp (without a lampshade) and a globe in the middle of the circle.
- He or she will put a large star on New York State so students can easily spot this area during the activity.
- He or she will turn the lights off in the classroom to simulate the darkness of the atmosphere.
- The teacher will first have New York State face the lamp. He or she will ask students if it is daylight or nighttime in New York when Earth is in this position.
- He or she will then rotate the globe so New York faces away from the lamp. The teacher will now ask students if it is still daylight in New York or if it has become nighttime.
- He or she will then tilt the globe and simulate it orbiting around the Sun. The teacher will show students that there are particular points where certain hemispheres on Earth are closer to the Sun.

- The teacher will ask students if they think that this part of the world would undergo summer or winter at this time.
- The teacher will then ask his or her students to explain what hemispheres they think would undergo winter when the Earth is in this same position.

Source: https://docs.google.com/a/share.brevardschools.org/file/d/0B5--VfTZqLfuNmFkMDI1ZWMtZTcwOS00NmI2LTk5NjItZjA3YWU4YmI0MjRk/edit?hl=en_US&pli=1

Materials: Smart Board, computer, yellow ball, inflatable globe, lamp, science journals, pens, pencils, star sticker, checklist, science notebooks

Explanation

After the class finishes these demonstrations, the teacher will turn the lights on and ask students to remain seated in their circle for a whole group discussion. During this whole group discussion, the teacher will ask students questions in order to engage them in higher order thinking skills:

- Does the Earth's revolution have anything to do with daytime and nighttime? If no, why not?
- Does the Earth's rotation have anything to with the change in seasons? If no, why not?
- Do countries near the poles of the Earth undergo changes in seasons?
- What would happen if the Earth did not rotate but still revolved?

Vocabulary: rotation, revolution, orbit, axis, hemispheres, counterclockwise

Elaboration

To help students gain a more sophisticated understanding of Earth's rotations and revolutions they will apply their knowledge to mathematics. The teacher will post questions on the Smart Board such as: "How many revolutions will the Earth undergo in 1,460 days?" and "How many rotations will the Earth undergo in 120 hours?" Students may work with a partner to solve these problems.

These types of questions will not only extend students' learning by having them use higher order thinking skills, but will also help them practice using their multiplication and division in order to solve short word problems (activity displayed at the end of this lesson).

Evaluation

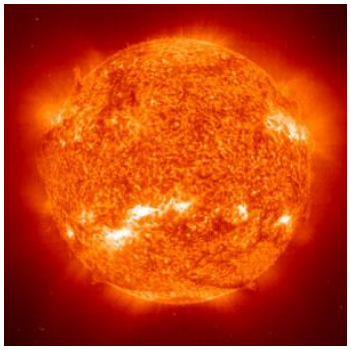
- Informal assessment will occur throughout this lesson.
- During the demonstrations, the teacher will use students' answers and comments to assess their understanding of the two learning objectives. Also during the whole group discussion, the teacher will use a checklist to mark what students understand the concepts of rotation and revolution and the effects they have on Earth and what students need additional practice and instruction on the material.
- As another form of assessment, the teacher will have students respond to this statement for homework: "Earth's rotation and revolution around the Sun affects our planet in specific ways."
- Students must write their response in paragraph form in their science notebooks.
- They must include at least four details that they learned from the lesson.
- The teacher will collect each student's science notebook the next day and will mark off each student's level of understanding of the scientific concepts.

Smart Board Extension Activity

Use your critical thinking and mathematics skills to investigate the answers to these questions!! You may work with a partner if you choose to do so!

- How many revolutions will the Earth undergo in 1,460 days?
- How many rotations will the Earth undergo in 120 hours?
- How many revolutions with the Earth undergo in 730 days?
- How many rotations will the Earth undergo in 168 hours?

Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science



"Feeling Hot Hot Hot! - Discovering the Wonders of the Sun"

Grade 4

Learning Objective Goals:

1. Students will comprehend that the Earth's Sun is an average-sized star.
2. Students will identify the life cycle of the Sun (medium stars).

Science Standards

- Science as Inquiry
- Science, Reading, Art and Writing
- Earth Science
  - Earth's Sun is an average-sized star. The Sun is more than a million times greater in volume than Earth.
  - Other stars are like the Sun but are so far away that they look like points of light.
- Learning Science by Collaboration
- Safety
- Learning Science through Technology

New York State Core Curriculum Standards

Reading Standards for Informational Text: Grade 4

1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.
3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a Grade 4 topic or subject area.

Writing Standards: Grade 4

2. Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

c. Link ideas within categories of information using words and phrases (e.g., another, for example, also, because).

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

Science Ideas:

- The Sun is a star and there are billions of stars in the universe.
- Unlike the Earth, the Sun is a huge ball of extremely hot gases (e.g. hydrogen and helium).
- The diameter of the Sun at its equator is 109 times greater than the diameter of the Earth. However, compared to other stars in the universe, the Sun is not very large. It appears larger to us than other stars because it is closer to our Earth.
- A star (our Sun) is formed from a nebula. A nebula is an interstellar cloud of dust and plasma.
- When a star no longer has fuel it dies because the inside force that burns the fuel is not equal to the gravity pushing on it from the outside.
- After this happens, it becomes a Red Giant. During this time, the Sun's core increases in heat because of the unequal force of gravity pushing on the star.
- Next, the Sun will turn into a White Dwarf. A White Dwarf is a star that is about the size of the earth. The higher the density or mass of the White Dwarf, the smaller it is in size. Most White Dwarfs are extremely hot and remain hot for a very long time.
- After its life as a White Dwarf, the Sun becomes a Black Dwarf. A Black Dwarf is what is left of the White Dwarf after it cools. These dwarfs are no longer visible because they have no more fuel.

- The Sun's life cycle takes place over billions of years.

Resources: "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, http://teachers.net/lessons/posts/3861.html, "The Young Oxford Book of Astronomy" by: Simon Mitton and Jacqueline Mitton

Safety Procedures: The teacher will model the proper way to gently "emit force" on a partner during the engagement activity. Students may become excited during this hands-on activity and start becoming rough with their partner. Therefore, this activity should carefully be monitored. Students will be told if they do not act appropriately, they will not be able to participate in the fun activity.

Differentiation Strategies:

- During this lesson, the engagement and exploration activities include partnered work. Collaboration establishes a type of peer-tutoring system within the classroom. This type of system differentiates readiness and will be beneficial to both students with and without disabilities. Higher performing students will learn through helping others and lower performing students will benefit from working with their peers.
- The extension activity of this lesson differentiates learning profiles. When completing their Venn Diagrams, students will be given the option to include pictures to support their answers. This element of the activity will be beneficial to students who struggle with writing. Drawing pictures will give them another way of communicating their learning.
- Teachers can give students with visual impairments an enlarged copy of the adapted article from "Young Oxford Book of Astronomy" in order to differentiate process. This enlarged version will help avoid students' visual inabilities from impeding on their ability to understand the article.
- In addition, to differentiate process, speech-to-text assistive technology such as the Kurzweil 3000 would be extremely beneficial to students with cognitive disabilities, learning disabilities, and English Language Learners. This device will provide translation support to ELL students when they are reading the text. It also can read text

word by work or by phrase and sentence. This feature will assist students who struggle with reading gain a deeper understanding of the text.

Procedures

Engagement

To motivate students' learning, the teacher will assign students to partners. One student will be partner "A" and one student will be partner "B". The teacher will ask students to clasp hands and gently emit the same amount of force on each other. At this time, students' arms will be stable on their desks because they will both be emitting the same amount of force. Next, the teacher will ask partner "A" to relax their arm and stop emitting force. During this time, partner "B" will continue their role of exerting force on partner "A". Partner "A's" arm will move downward because forces are unstable.

Source: http://teachers.net/lessons/posts/3861.html

After this engagement activity, the teacher will ask students the following questions to encourage them to begin actively thinking about the topic:

- What happened when both partners emitted the same amount of force?
- After partner "A" stopped emitting force, what happened?
- What do you think would happen if unequal amounts of force were exerted on our Sun?
- What is our Sun?
- Will our Sun ever stop burning?

Exploration

- Students will continue to work with partners for the exploration activity.
- The teacher will hand each student an adapted article from "The Young Oxford Book of Astronomy" by: Simon Mitton and Jacqueline Mitton. This article will describe the life cycle of a medium-sized star (the Sun). Students will also learn that the Sun begins to die when a star no longer has fuel. This happens because the inside force that burns the fuel is not equal to the gravity pushing on it from the outside (relating back to the engagement activity).

- Partners will be directed to highlight the important facts for each phase of the life cycle on their article.
- After pairs have completed this task, the teacher will ask for volunteers to share their ideas.
- The teacher will categorize these pieces of information on a concept map that is displayed the Smart Board.
- Next, students will use their articles to create a "movie flipbook". Each student will make his or her own flipbook. This flip book will display the different phases of the Sun's life cycle. This will serve as an engaging and interactive visual. As students quickly flip through the pages, the Sun will evolve into a Black Dwarf.
- On the back cover of their flipbooks, students will write a brief summary that explains the different phases of the Sun's lifecycle. This flipbook will serve as a great resource for students.

Flipbook activity source: http://teachers.net/lessons/posts/3861.html

Materials: Adapted articles from "The Young Oxford Book of Astronomy" by: Simon Mitton and Jacqueline Mitton, Smart Board, heavy white paper, finished flipbook for demonstration, markers, crayons, colored pencils, pencils, erasers, pens, stapler

Explanation

After this activity, the teacher will conduct a whole group discussion to summarize what students have learned. During this time, the teacher will also ask students higher order thinking questions in order to help them think critically about the topic:

- What would happen to our Earth once the Sun becomes a Black Dwarf?
- Do different sized stars undergo the same life cycle as the Sun?
- How is the Sun different from our Earth?

Vocabulary: Sun, medium stars, nebula, plasma, force, gravity, hydrogen, helium, Red Giant, White Dwarf, Black Dwarf

Elaboration

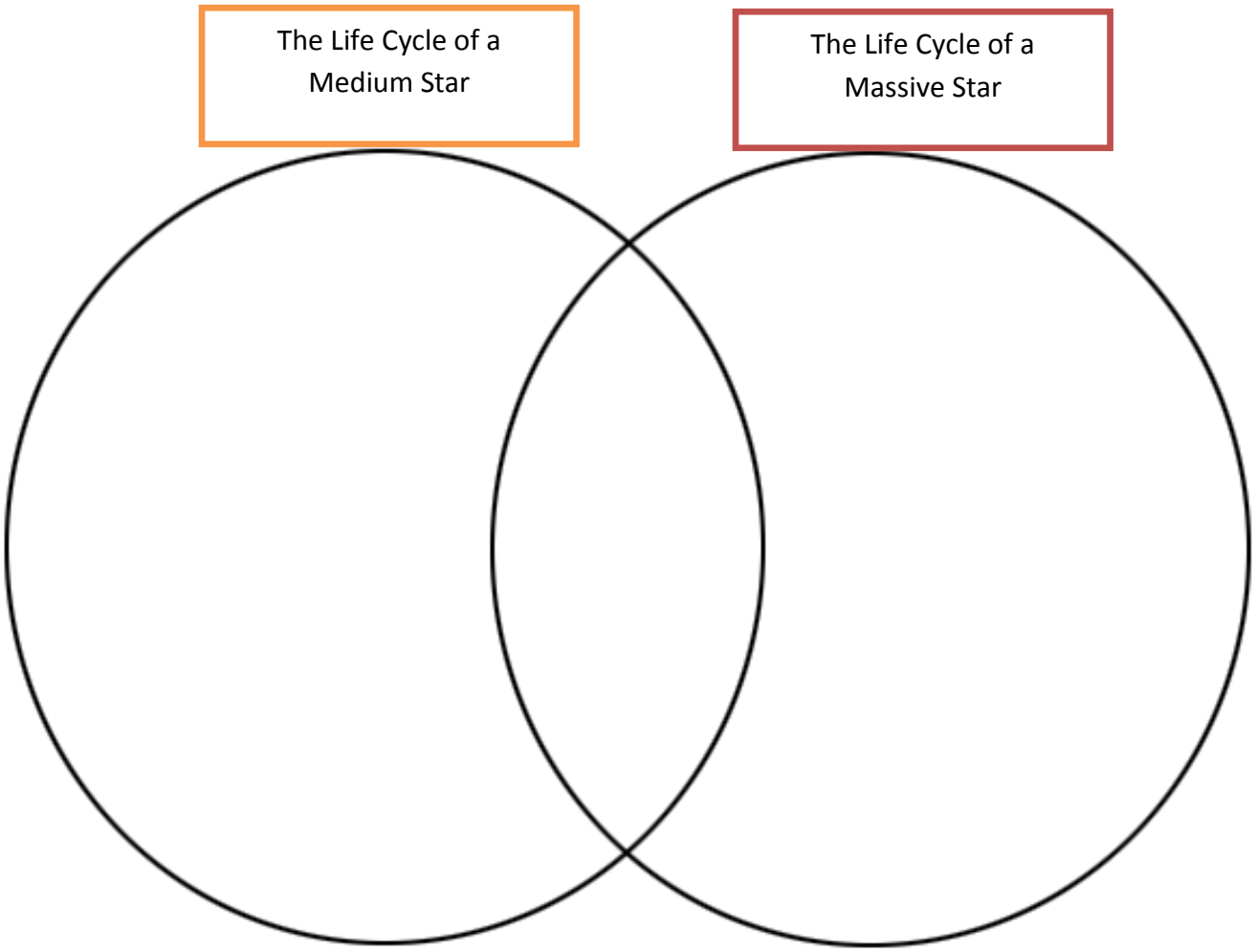
The next day, the teacher will extend students' learning of stars by teaching them about "massive stars". Since the Sun is a "medium star" it has a different type of life cycle than these larger stars. After students learn about "massive stars," they will create a Venn Diagram to compare and contrast these stars' life cycles (Venn Diagram displayed at the end of this lesson).

Evaluation

- Informal assessment will occur throughout this lesson.
- During the activity and whole group discussion, the teacher will use students' answers and questions to assess their understanding of the two learning objectives.
- In addition, the teacher will collect each student's flipbook to mark down if each student correctly depicted the Sun's life cycle and if each student listed accurate facts about each phase of the life cycle on their back cover.
- These flipbooks will be returned to each student after they are evaluated.
- After the teacher has collected information about each student's understanding level, he or she will adjust instruction accordingly.

Name: _____ Date: _____

Directions: Use this Venn Diagram to list the similarities and differences between medium star's and massive star's life cycles. Be specific with your facts. You may use the space below the Venn Diagram to draw pictures to explain your answers if you choose to do so!



Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science

"The Moon's Many Faces"

Grade 4

Learning Objective Goals:

1. Students will recall why moon phases are seen from Earth.
2. Students will identify that the Moon's phases occur in a cyclic pattern.

Science Standards

- Science as Inquiry
- Science, Reading, Mathematics and Writing
- Earth Science
  - Natural cycles and patterns include the appearance of the Moon changing as it moves in a path around Earth to complete a single cycle.
  - The Moon reflects light from the Sun. The Moon's phases, as observed from Earth, are the result of seeing different portions of the lighted area of the Moon's surface.
  - The phases repeat in a cyclic pattern in about one month.
  - The apparent motions of the Sun, Moon, planets, and stars across the sky can be explained by Earth's rotation and revolution.
- Learning Science by Collaboration
- Safety
- Learning Science through Technology

New York State Core Curriculum Standards

Reading Standards for Informational Text: Grade 4

1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine the main idea of a text and explain how it is supported by key details; summarize the text.

3. Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
4. Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a Grade 4 topic or subject area.

Mathematics Standards: Grade 4

Numbers and Operations-Fractions

1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Science Ideas:

- The Moon does not give off its own light; instead, it reflects light from the Sun.
- Observers see different phases of the Moon as a result of its orbit around Earth.
- It takes our moon about 29.5 days to move through its eight phases.
- The Moon is undergoing the New Moon phase when the side of it, that faces the Earth, is not illuminated. In addition, the Moon is up during the day, and down during the night; therefore, observers cannot view the Moon during this phase.
- The Moon is undergoing the Waxing Crescent phase when part of it starts to become visible. This “lunar sliver” can be viewed each evening for a few minutes after sunset. The Moon is said to be "waxing" because each night a little bit more of it becomes visible and it is visible for longer periods of time.
- The Moon is undergoing the First Quarter phase when ½ of it is visible during the first half of the evening.
- The Moon is undergoing the Waxing Gibbous phase when most of it is visible. During this phase, the entire Moon is illuminated besides a small sliver and the Moon remains in the sky most of the night.
- The Moon is undergoing the Full Moon phase when observers can view the entire face of the moon. A Full Moon rises when the evening begins, and sets when morning is ushered in.

- The Moon is undergoing the Waning Gibbous phase when observers can see all but a sliver of it. Instead of seeing more of the Moon each night, during this phase, observers begin to see less and less of the Moon each night.
- The Moon is undergoing the Third Quarter phase when observers can see exactly ½ of its illuminated surface.
- The Moon is undergoing the Waning Crescent phase when observers can only see a small sliver of it, and this sliver is only visible before morning.

Source: http://www.kidsastronomy.com/astroskymap/lunar.htm

Resources: "Science Stories: Methods for Elementary and Middle School Teachers" by: Janice Koch, http://www.kidsastronomy.com/astroskymap/lunar.htm, "The Moon Seems to Change" by: Franklyn M. Branley, http://stardate.org/nightsky/moon#cs_phases%20of%20the%20moon, http://www.schoolfamily.com/print-and-use-tools/document/1152-internet-safety-contract

Safety Procedures: Safety precautions will be taken throughout this lesson. Before students will be allowed to go on the Internet, they must sign their Internet Safety Contracts. While students explore the "Star Date" website, the teacher will walk around the classroom to monitor each student. Also, before students complete the Oreo Activity Sheet, the teacher will make sure that none of the students in the class have allergies to the items being used. After the activity, students will be allowed to eat an Oreo cookie as a treat. During this time, the teacher will monitor his or her class to make sure that students remain in their seats to prevent any health concerns.

Differentiation Strategies:

- During the reading portion of the Elaboration activity, students will work in pairs. This will create a peer-tutoring system where higher performing students can assist lower performing students. This type of system differentiates readiness and will be beneficial to students with and without disabilities.

- For students with special needs, “The Moon Seems to Change” by Franklyn M. Branley will be provided on audio in order to differentiate process. This will not only help to students with disabilities but will also help students with visual impairments.
- In addition, the teacher will also differentiate readiness and content by highlighting critical pieces of information in “The Moon Seems to Change” copies for students who struggle with the reading. The highlighted information will help them complete their investigation in a more effective manner

Procedures

Engagement

For a “hook” activity, the teacher will have students use their Netbooks to explore the website “stardate.org.” This website contains a tool that allows students to see the approximate Moon phases for each day in 2013. Students will explore this website and draw a picture illustrating the phase of the Moon that is supposed to occur the night of the day that the lesson is conducted. Students must sign the Internet Safety Contract before they complete this activity. (The Internet Safety Contract is attached to the end of this lesson)

Star Date Activity Source:
http://stardate.org/nightsky/moon#cs_phases%20of%20the%20moon

After this Engagement activity, the teacher will ask students the following questions to encourage them to begin actively thinking about the topic:

- What is our Moon?
- Does the Moon produce its own light? If not, why does it appear illuminated?
- Why are there phases of the Moon?
- How many phases do you think the Moon undergoes?
- Are the phases of the Moon random or do they occur in a certain pattern?

Exploration

- Students will read copies of "The Moon Seems to Change" by Franklyn M. Branley with a partner. This book gives many details about the Moon, explains its orbit around Earth, and explains its eight phases.
- After reading this text, students will "Turn and Talk" with their partner. During this talk, they will work together to list the phases of the Moon in their science notebooks and explain two characteristics of each phase.
- After each pair has completed this task, the teacher will give each student an Oreo Activity Sheet. This activity will have students recreate the eight phases of the Moon using Oreo cookies.
- Students will work independently at this time but they may discuss their answers or process with the students sitting next to them if they choose to do so. This engaging hands-on activity will help students gain a deeper understanding of the eight phases of the moon. This activity and its directions are attached to the end of this lesson.

Oreo Activity Source: http://analyzer.depaul.edu/paperplate/Oreo%20Moon%20Phases.htm

Materials: Netbooks, Internet Safety Contract, copies of "The Moon Seems to Change" by Franklyn M. Branley, 8 Oreo cookies per student, plastic spoons, Oreo Activity Sheets, pens, pencils, science notebooks

Explanation

After these activities, the teacher will conduct a whole group discussion to summarize what students have learned about the moon and its phases. During this discussion, each pair will also get a chance to share what they have written in their science notebooks with the class. During this time, the teacher will also ask students higher order thinking questions in order to help them think critically about the topic:

- Do different places in the world see different phases of the Moon? Why?
- Why is it impossible for one place to see the same phase of the Moon each night?
- What would happen if the Moon did not orbit around the Sun?

Vocabulary: Moon, craters, reflection, orbit, waxing, waning, cyclic, New Moon, Waxing Crescent, First Quarter Moon, Waxing Gibbous, Full Moon, Waning Gibbous, Third Quarter Moon, Waning Crescent

Elaboration

For the elaboration activity, the teacher will integrate a fraction activity into students' studies of the Moon's phases. This will extend students' learning and build coherence across different subject areas. This activity and its directions are attached to the end of this lesson.
Picture Source: http://faculty.icc.edu/easc111lab/labs/labk/prelab_k.html

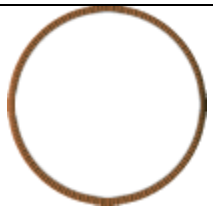
Evaluation

- Informal assessment will occur throughout this lesson.
- The teacher will review students' responses in their science notebooks and evaluate the figures on their Oreo Activity Sheet in order to assess their understanding of the two learning objectives.
- In addition, the teacher will administer an Exit Card to assess each individual's mastery level of the two learning objectives. After the teacher analyzes students' responses, he or she will adjust his or her instruction accordingly (Exit Card is attached to the end of this lesson).
- Lastly, after this last lesson is conducted, a unit test will be administered to assess each student's understanding of scientific concepts found within this Solar System Unit.

Name: _____ Date: _____

Oreo Moon Phases Activity

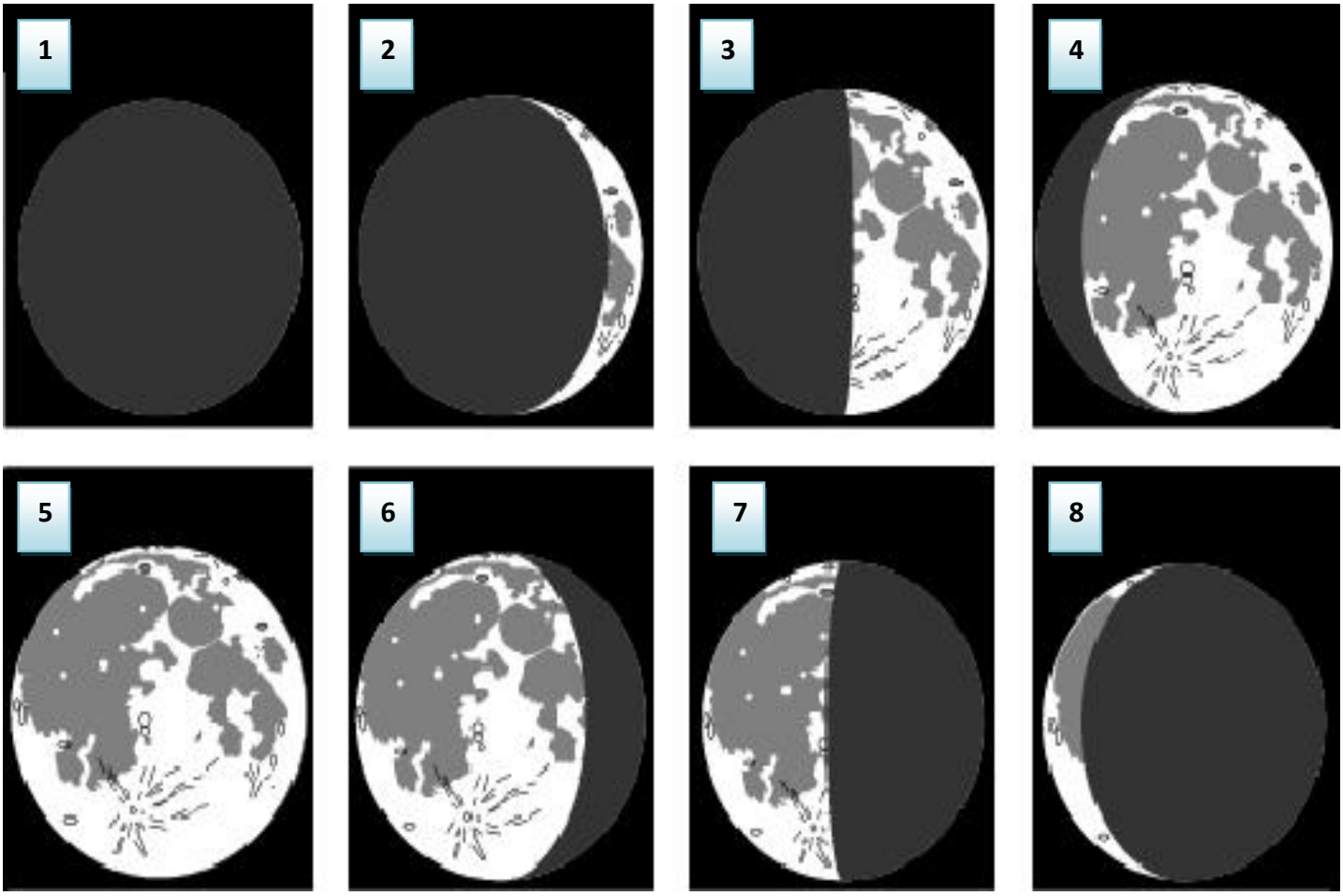
Directions: Halve and scrape Oreo® cookies to illustrate the Moon's different phases. Then, arrange cookies on the poster in linear fashion beginning with the New Moon and ending with the Waning Crescent Moon to display the Moon's cycle!

1	2	3
 **New Moon** Completely (or almost completely) dark.	 **Waxing Crescent** A small sliver of light on the right.	 **First Quarter (or Half) Moon** The right half of the Moon is light.
4	5	6
 **Waxing Gibbous** Three quarters of the right side of the Moon is light. The light is in the shape of a humpback (which is what the word "gibbous" means!)	 **Full Moon** The entire Moon is bright.	 **Waning Gibbous** Three quarters of the ***left*** side of the Moon is light.
7	8	
 **Third Quarter (also Half) Moon** The ***left*** half of the Moon is now light.	 **Waning Crescent** A small sliver of light now appears on the ***left*** side.	

Name: _____ Date: _____

Moon Phases Fraction Activity

Directions: Let's break the Moon into fourths! Determine the approximate fraction for each phase of the Moon. Write each picture's fraction on the number of the line that corresponds to it.



1_____

2_____

3_____

4_____

5_____

6_____

7_____

8_____

Name: _____ Date:_____

Exit Ticket

Directions: Write a brief paragraph (use complete sentences and proper grammar!) that addresses these 3 key questions:

- Why do Moon phases occur?
- What are the eight phases of the Moon?
- Are Moon phases random or cyclic?

Internet Safety Contract

I _____ promise to obey all house rules about using the Internet.

- I will not bend the rules about which websites I may visit.
- I will follow the rules about how long I'm allowed to stay online.
- I will never open an email attachment from someone I don't know or click on a web link or pop-up.
- I will never download anything from the Internet without first asking permission.
- I will never share my name, address, or telephone number or the name of my school. If anyone asks me for this information, I will tell my parents or another adult I trust.
- I will never tell anyone other than my parents my password. Not even my best friend.
- I will never post my picture or a video of myself online without permission.
- I will never lie about my age online.
- I will not reply to anyone online who makes me feel uncomfortable or angry.
- I will tell my parents or another adult I trust if anyone online asks to meet me in person.
- I will get up from the computer right away and tell my parents or another trusted adult if I see something that scares me or makes me feel uncomfortable.
- I will be respectful to other people online. I won't pick fights or use mean words.
- If someone is mean to me online or hurts my feelings, I will tell my parents or another trusted adult right away.
- I will show my parents how to use my favorite sites, so we can explore them together.

Source: http://www.schoolfamily.com/print-and-use-tools/document/1152-internet-safety-contract

Lauren Mazzotta
Dr. Morrison
Teaching Elementary Science

Unit Plan Reflection

When preparing and creating this unit plan, I made particular instructional decisions to ensure that I maximized my students' learning experiences. When developing this unit plan, I found resources that I could use to incorporate English Language Arts and technology into my lessons. I know that it is important to integrate science across subject areas. Therefore, many of my "exploration" and "elaboration" activities include the use of partnered reading and writing. Also, particular "hook" activities require my students to explore a website that addresses celestial concepts or has my students watch a video/listen to a song that will jumpstart their critical thinking and inquiry on different topics. Additionally, in order to include mathematics within my lessons, my students will calculate the amount of days it would take Earth to make a specific amount of rotations or revolutions, and my students will explore the phases of the Moon using fractions. This not only helps me address the Grade 4 New York State Common Core Learning Standards in my lessons, but also helps me make science more meaningful for my students by having them apply the information gained in class to other content areas.

When developing this unit plan, I also wanted to make sure that I incorporated many hands-on learning experiences for my students. Throughout each lesson, I have created higher order thinking questions that I will ask my students in order to help them think critically about the material. Inquiry is an essential part of learning science; therefore, I wanted to create an environment where my students will be able to ask questions and determine solutions based on their own interactive learning experiences. My goal when creating these lessons was to create opportunities for each student in my classroom (boys and girls, students with and without disabilities) to attain a sense of inquisitiveness about the world around them and to acquire a

passion for learning science. Science is sometimes thought as an intimidating subject as students progress throughout the older grades in schooling; however, if students gain this type of foundation in science during the early elementary grades, they will be excited about learning new science concepts and may be more likely to choose a path in science for their future career.

Unfortunately, I was not able to observe any actual science lessons during my fieldwork experience because my teacher had to focus her instruction on mathematics and English Language Arts due to the state-mandated testing for fourth grade students. However, I was lucky enough to see a presentation that a group of IBM engineers conducted in our classroom. During this time, the engineers explained the importance of women entering the science field in order to reduce the gender stereotype that only males can become engineers. During their activity, they placed students in heterogeneous groups of 5 students. They stated that at least two female students must be a part of each group. I enjoyed seeing this grouping technique being implemented because I know how important it is to foster an excitement for science in each student. Both male and female students must be encouraged to pursue their interests and must be assured that they can be successful in any career that they choose. This experience further ensured me that my choice to include heterogeneous grouping within my lessons was an effective instructional decision.

Creating this unit plan has helped me grow as a future science educator. I have not only attained knowledge about the essential elements that make up science lesson plan, but I have practiced how to integrate these components, within a science lesson, in order to create effective discovery experiences for each student. Furthermore, this assignment has helped me practice integrating different content areas within my science instruction and has helped me practice determining different types of differentiation for each of my unique students. In

addition, creating this unit plan has taught me to always anticipate potential safety issues that can occur during hands-on learning activities. Thinking about prospective problems allows me to address these concerns prior to conducting my lessons. This helps me ensure that each lesson provides my students with a safe interactive learning experience. William Lawrence Bragg once said: "The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them." Bragg's words portray my goals when creating this science unit. I did not want to simply relay facts to my students; this assignment has taught me to create lessons that encourage students to compose inquiries about the science that they view in the outside world. This approach is a critical aspect of teaching science that I will always keep with me in my future classroom.