Saint Joseph's University
Pennsylvania Standards Aligned System
Lesson Plan Format

Candidate Name: Caroline Lafferty		**Course: EDU 363**
Subject: Science	**Grade Level: 4th**	**Duration: 60 minutes**

Lesson Context:

Big Ideas and Essential Questions

Big Idea: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

EQ: How and why is Earth constantly changing? (PESAS curriculum framework)

Big idea: The Earth's processes affect and are affected by human activities.

EQ: How do Earth's processes and human activities affect each other? (PESAS curriculum framework)

Central Topic and Concepts of the Content Areas

Earth's Ozone Layer

Lesson situation

This is the sixth lesson in a 15 day unit about our solar system. Prior to this lesson, students will have learned about the stars, planets, and moons, objects in the solar system, the sun, and mercury and venus.

Learner Outcomes (Instructional Objectives):

1. As a result of this lesson, students will be able to identify Earth's position in the solar system
2. As a result of this lesson, students will be able to identify and define the Ozone Layer, and what harms it.
3. As a result of this lesson, students will be able to identify how humans have impacted the Ozone Layer over the years

Related Academic Standards: (Common Core and/or PA Standards – as relevant to the standards used by the school district)

Standard - 3.3.4.A2
Identify basic properties and uses of Earth's materials including rocks, soils, water, and gases of the atmosphere.

Standard - 3.4.4.B2
Explain how the use of technology affects the environment in good and bad ways.

Standard - 3.1.4.C4

- Distinguish between scientific fact and opinion.
- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.
- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.
- Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.
- Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

Vocabulary:

Ozone Layer: an invisible layer of protective gases that circle the earth. The ozone layer stops most of the harmful ultraviolet rays, or UV rays, from hitting Earth.

Atmosphere: envelope of gas surrounding an object in space

Troposphere: the lowest part of Earth's atmosphere. It contains about 75% of the atmosphere's mass and 99% of its water vapor and aerosols. ... The troposphere is where people live, because it reaches down to ground level

Stratosphere: one of the layers of the atmosphere of the planet Earth. It extends from about 8 km above the poles (18 km above the equator) to about 50 km. In the stratosphere, the temperature rises with increasing height. This makes the stratosphere very stable. This temperature gradient is caused by the ozone layer which absorbs some UV radiation from sunlight.

Mesosphere: a part of the atmosphere. It is between the stratosphere and the thermosphere. On Earth, the mesosphere starts at 50 kilometers above the planet to about 90 km above the planet.

Thermosphere: the fourth layer of the Earth's atmosphere. It is directly above the mesosphere (middle layer) and directly below the exosphere (top layer).

Exosphere: The exosphere is the highest and top layer of the Earth's atmosphere. It marks the edge of space.
There are very few molecules in this layer. The lightest atmospheric gases such as hydrogen and helium exist throughout the exosphere. Heavier ones like carbon dioxide and atomic oxygen are near the base.

Materials:

1. 2 water bottles filled with hot water
2. magnifying glass
3. putty
4. science journals

Resources:

Activity:
OZONE LAYER DEMONSTRATION - Childrens Science Experiments

Videos:
Climate 101: Ozone Depletion | National Geographic

Earth's Atmosphere tool:
Layers of the Atmosphere Mouseover the pictures and scroll down to learn more

Definitions:
Troposphere Facts for Kids

Stratosphere Facts for Kids

Mesosphere Facts for Kids

Thermosphere Facts for Kids

Instructional Procedures(s):

Engage:

To begin, students will be seated on the carpet, where a question will be on the board that says "what would we do if sunscreen did not exist?" Students will have five minutes to complete a "think- pair -share" about the question. After 5 minutes, the teacher will call on three students to share their responses. The teacher will give feedback according to the responses that were given. After the responses have been shared, the teacher will pose another question asking "what do you think would happen if the Earth did not have sunscreen." The teacher will give the students a minute to think, and we'll call on a couple students to answer the question, Writing their answers on the board. After five students have shared their answers, the teacher will ask the students to vote on which response would make the most sense. The teacher will tally up the votes and write them according to each of the responses.

Explore:

After the responses have been tallied, the teacher will call the students back to their seats for the students to have the materials for the experiment. The teacher will also have a separate car in the front of the classroom so that they can walk the students through the experiment. The teacher will first tell the students that the water bottles are hot, and we'll discuss safety precautions with the students. The teacher will tell the students to open their science journals, and to make 2 columns 1 labeled with water bottles filled to the top, Which will represent more CFCs in the atmosphere, and another column labeled water bottle filled halfway, which will represent less CFCs in the atmosphere. After the students have written this in their science journals, the teacher will ask all the students to Hold up their science journals so that the teacher can make sure that the columns are labeled correctly. After the teacher has ensured that the students have labeled their columns correctly, the teacher will then tell the students to put a thin layer of putty on the top of each of the water bottles and make sure that no air is getting out. The teacher will then ask the students to write in their science journals three sections in each column one marked “before”, another one marked ``during”, and the third one marked “after.” The teacher asked the students to write down any observations that they can make about each of the water bottles before timing for 2 minutes. The teacher will go around the classroom to make sure that the students are making observations about the water bottles. After about a minute the teacher will ask the students if they are ready for the 2 minute timer and if all the students are ready, the teacher will begin the timer. During the 2 minutes the students are to observe each of the water bottles and the changes between the putty on each bottle. The students will write down their observations in the “during” section of their notebooks. They should observe that the water bottle filled to the top Is developing more holes in the putty then the water bottle filled only halfway. After the two-minute Mark, the teacher will ask the students to write down their observations in the “after “section.

Explain:

After the students have completed writing their observations in the after section, the teacher will ask the students to bring their science journals to the carpet. The teacher will then ask the students about any observations that they made for each of the sections, Along with any differences between the two water bottles during each section of the activity. The teacher then refers back to the question of “what would happen if the Earth did not have sunscreen?” The teacher will explain how the party on top of the hot water bottle represents the ozone layer in the atmosphere which protects Earth From harmful UV rays from the Sun. The teacher will then play the students the video “Climate 101: Ozone Depletion” from National Geographic. After the video, The teacher will pose the question to the students “between the difference in holes of the two water bottles, which water bottle represents one with more CFCs, and which water bottle represents the Earth as last CFCs.” The teacher will give the students 2 minutes to think about their responses, and then we'll allow the students to share. After the students have to share their responses, the teacher will refer to the responses that they written on the board before the experiment and will address any misconceptions about each of the responses.

Elaborate:

After the teacher has addressed all the mateen's options from each of the responses on the board, the teacher bold and elaborate saying that the ozone layer is a part of Earth's Stratosphere, the second layer of Earth's atmosphere. The simulation of each of the layers of earth's atmosphere. The teacher will then ask the students to flip the page over and Right the five layers of the atmosphere in their notebooks. The teacher will then show the students each of the layers of the atmosphere, and asked students to write down the height, gases, and Purposes of each of the layers. After the teacher has given a quick summary of each of the Liars, the teacher will ask the students to go back to their seats. In groups, each of the groups will be responsible for one layer of the atmosphere. The teacher will pass around a graphic organizer for each of the five layers, and will have the students go on their classroom page to access the resources that they can use to find more information about each layer. The students will have to fill out the information that they learned from their whole class discussion, but will also have to conduct research on what objects can reach their particular layer, and any facts that they learned that were not mentioned in their whole class discussion. The teacher will give the students 10 minutes. As the students are working, the teacher should check in with each group to make sure that they understand the content and the directions. After 10 minutes, the teacher will ask the students to come back to the carpet with their organizers, and will ask each group to present. As each of the groups are presenting, the students will be filling out the rest of their graphic organizer.

Evaluate:
Students will be evaluated formatively throughout the lesson through student responses, and their understanding of the activities. The students will also be formatively assessed through their presentations on the layers. Students will also be summatively assessed at the end of the unit through the unit test.

E-Learning:
E-Learning will be used during the engage, explain and elaborate portion of the lesson.

Addressing Learners' Diverse Needs:

- Accommodations and Adaptations (IEPs, 504 Plans)
- Language adjustments made for specific ELP levels (include ELP level and PA ELP Standards)

- Challenges for advanced learners

Formative/Summative Assessment:

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Candidate Name: Caroline Lafferty		**Course: EDU 363**
Subject: Science	**Grade Level: 4th**	**Duration: 50 minutes**

Lesson Context:

Big Ideas and Essential Questions:

Big Ideas:

The universe is composed of a variety of different objects, which are organized into systems each of, which develops according to accepted physical processes and laws.

The Earth's processes affect and are affected by human activities.

EQ:

What is the universe, and what is Earth's place in it?

How do Earth's processes and human activities affect each other?

Central Topic and Concepts of the Content Areas

Objects in space- Space junk

Lesson situation:

This lesson is the second lesson in a unit that talks about our solar system, and the objects and planets within it.

Prerequisite Skills

Prior to the lesson, students will have learned about the sun, moon, and stars.

Learner Outcomes (Instructional Objectives):

1. As a result of this lesson, students will be able to determine the characteristics of objects in space
2. As a result of this lesson, students will be able to know how orbits work
3.As a result of this lesson, students will be able to define the term "gravity"
4. As a result of this lesson, students will be able to define what "space junk" is, and how it impacts humans

Related Academic Standards: (Common Core and/or PA Standards – as relevant to the standards used by the school district)

Standard - 3.3.4.B3

- Distinguish between scientific fact and opinion.
- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.

- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.
- Use data/evidence to construct explanations and understand that scientists develop explanations based on their evidence and compare them with their current scientific knowledge.
- Communicate procedures and explanations giving priority to evidence and understanding that scientists make their results public, describe their investigations so they can be reproduced, and review and ask questions about the work of other scientists.

Standard - 3.4.4.A1
Understand that tools, materials, and skills are used to make things and carry out tasks.
Standard - 3.4.4.A2
Understand that systems have parts and components that work together.
Standard - 3.4.4.A3
Describe how various relationships exist between technology and other fields.
Standard - 3.4.4.C2
Describe the engineering design process:
Define a problem. Generate ideas. Select a solution and test it. Make the item. Evaluate the item. Communicate the solution with others. Present the results

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Vocabulary:

Gravity: an invisible force that pulls objects toward each other

Orbit: An orbit is the path of an object around a particular point in space, for example the path the Moon takes around the Earth. Orbits are determined by gravity, and are often 'elliptical', the shape of an oval.

Space Junk: Orbital debris, a type of space junk, is any human-made object that has stopped working but continues to float around the Earth. This includes abandoned satellites and pieces of spacecraft, such as rocket stages

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Materials:
Big easel
Markers
Smartboard

Resources:
Attack of the Cosmic Space Junk!

Space Junk.

What Is Gravity? | NASA Space Place – NASA Science for Kids

Space for Kids - Different orbits - ESA

Royal Institution Advent Calendar

Instructional Procedures(s):

Engage:
To engage the students in the last time, students will be seated at the carpet where the teacher will pose the question "what happens when we need to throw something away?" The teacher will call on a student to answer where the student should say that they use a trash can to throw items away. The teacher will then ask the students "what happens if astronauts in space need to throw something away?" The teacher will call on the few students to hear their responses and will write their responses on the board. The teacher will ask the students "what would happen if there were no trash cans?" The teacher will call on a few students to share their responses, and the teacher will elaborate by saying that they would run out of places to put the tras.h and that trash would overflow. The teacher will then ask the question of "what would happen if trash overflowed in space? Where would all the trash go?"

Explore:
After the teacher has posed the questions to the students, the teacher will allow the students to sit back in their seats where they will have a large paper easel and different colored markers. The teacher will tell the students that they have to be tasked with creating a device that captures trash in space and safely brings it back to Earth where they can either reuse it or dispose of it properly. The teacher will also tell the students that they have to draw the device, list what each of the parts are, what's our purposes are, and how they would plan on safely bringing the trash down into Earth to dispose or reuse of it and how it would get back into space safely. The students will have five minutes to draft down any ideas that they have independently in their science journals. After the students of had five minutes to collect their independent thoughts, the teacher will allow the students to have 10 minutes to share their ideas with their peers at the table. As the students are talking, the teacher should go around and ask probing questions to the students to ensure that they are following directions and to hear about any ideas that they might have on how they can collect trash in space. After the 10 minutes of collaboration has gone, the student should have figured out the main ideas that they want to include on their device. the students will have 15 minutes to create their device. Again as the students are creating their device, the teacher must go around and ask the students questions about the device that they are creating. The students will have an additional 10 minutes after they create the device to answer the questions that were assigned to them at the beginning. After the time of creating and answering the questions is up, the teacher will call the students back to the carpet bringing their drawing of the device and the questions with them. The teacher will assign 10 minutes out of the lesson for the students to stand up and present their device asking them what the device's name is, how

it can collect trash from space, and how it can bring the trash back to earth safely, and how it can return to space.

Explain:
After each of the groups have presented, the teacher will play "Attack of the cosmic space junk!" For the class. The teacher will explain to the students that the term for Space trash is in fact space debris, fragments of rockets and other failed launches from missions to space. The teacher will then ask the students how the devices that they made compared to the ones that were shown in the video. The teacher will call on a few students to first share the similarities that they have, and call on another few students to share the differences between the devices that they made, and the devices that were shown in the video. After the Teacher has heard from a few students, the teacher will then show the students the space debris simulator where the teacher will walk through the history of space debris and where it is today. The teacher will also show the students examples of space debris that have happened in the last 5 years.

Elaborate:
To elaborate, the teacher will call the students back to their desks where they will be tasked with finding an article about space debris that has happened recently. And their science journals students will write about the event, and what pieces of space debris have been left in our orbit. Students will have 15 minutes to compose the responses. As the 15 minutes are going the teacher should walk around and monitor the computer screens, and make sure that they are riding in their science journals. After the 15 minutes units will be called back to the carpet and the teacher will ask the students to share some of the examples that they found. the teacher will have in the article also pulled out that shows them an example as well.

Evaluate:
Students will be formatively assessed throughout the lesson monitoring their responses and how well they collaborate and participate with the other members of their group. Their science journals will also be monitored and collected to make sure that they are doing the activity, and to see their responses.

E-Learning:
ELearning will be used during the elaborate and explain portion of this lesson.

Addressing Learners' Diverse Needs:

- For student X, who struggles with fine motor skills, this student will be given larger markers and pencils to write with. For the explain portion, the student could also type the responses and submit them to the teacher through a google forum to keep record of the students answers during the lesson.
- For student Y, who has ADHD, movement is incorporated into this lesson, but the student will be permitted to have a break in the lesson if they need to
- For student Z, who is ELL level 3, this student will have advanced notes on the lesson, and translations for the vocabulary that is being used in this lesson in their preferred language. This student will also be seated with people that they feel comfortable with so that they can communicate easier.

- The advanced learner will participate in the same activity and inquiry lesson as everyone else, but will have an additional assignment on writing about the history of space junk using the interactive simulation that was shown.

Formative/Summative Assessment:

Students will be formatively assessed throughout the lesson monitoring their responses and how well they collaborate and participate with the other members of their group. Their science journals will also be monitored and collected to make sure that they are doing the activity, and to see their responses. Students will be summatively assessed through a unit test at the end of the unit.