Instructional Approach:

Monday *Activity* – **O** **What:** Students are completing a concept map of what they know about planets, the sun and Earth and it's moon. **Why:** This will help me understand what prior knowledge the students already have about our solar system as well as specific areas I need to focus on during instruction and misconceptions the students may have. **E.ST.04.11**	**Tuesday** *Activity* – **CM3** (basketball, tennis ball, meter stick) **What**: Students will complete an investigation to learn about relative size in connection to Earth, the moon, and Sun. This activity asks the students to use a basketball and a tennis ball to observe how the sizes appear as they are next to each other and 4 meters away. As well as how many meters it takes to make the tennis ball appear larger than the basketball. **Why:** This hands-on activity shows the students that the distance between objects can affect its actual image. Some students have misconceptions that the sun and the moon are the same size because when they look into the sky they look the same size. This activity can help clarify their misconceptions. **E.ST.04.12**	**Thursday** **What:** As a class we will read and comprehend how the Earth and the moon move and what causes the seasons. The textbook breaks the motions of the moon and earth down in a simplistic yet descriptive form to help the students understand exactly how they move. **Why:** It is important for the students to not only read about the different orbits but to also see diagrams of the different moon phases and the seasons. **E.ST.04.21, E.ST.04.22, E.ST.04.23, E.ST.04.24**	**Monday** *Activity* – **O** **What:** Have the students demonstrate and describe the orbit of both the Earth and the moon. Divide students in groups of four, one student represents the Sun, one student represents Earth, one student represents the moon, and one student is describing the movements. As the student orbits the Earth, the Earth orbits the sun and the student describes the movements with vocabulary words such as revolution and rotation. The students will continue to rotate spots until each student has participated in each position. **Why:** This is both a visual and descriptive representation of how the Earth and the moon have specific orbit paths. The students can practice their description of it as well as visualize the orbits. **E.ST.04.21, E.ST.04.22, E.ST.04.23**

Tuesday *Activity* – **CM1** (index cards with planets names on them) **What:** Students will complete an investigation to find out how planets move. Students will make a visual model with themselves to show the planets move in their orbit paths. Nine students will have an index card: one with the sun and the other 8 with the names of the planets. The students will walk around the sun in their own path to show how different planets make one complete orbit faster than others. **Why:** This investigation is important because it is a visual representation of the closer the planet is to the sun the faster it will make one complete orbit and vice versa. **E.ST.04.21**	**Thursday** **What:** Students will read and comprehend the lesson on Our Solar System. This lesson explains the importance of the Sun in our solar system and the fact that it is a star not a planet. Also, this lesson explores other objects in our solar system such as planets, asteroids, and comets. It explains in words the planet paths around the sun and provides a chart to compare revolutions. **Why:** This lesson is important in the students' understanding of our solar system because it clears up a misconception the students held about the sun being a planet. Also it explains in words the purpose of the activity they performed the day before. **E.ST.04.11**, **E.ST.04.21**	**Monday** **What:** Students will complete a worksheet that illustrates the different locations of objects in our Solar System and how they move in our Solar System. **Why:** This review will help the students visualize the different objects in the solar system as well as the paths in which they orbit the sun. **E.ST.04.11**, **E.ST.04.21**	**Tuesday** *Activity* – **CM5** (string 4m long, 9 different colored markers, meter stick, worksheets 207/208) **CLASS LAB – see attached**
Thursday **What:** Begin reading the lesson about the planets. The first part of the lesson focuses on the inner planets. While reading about the characteristics of inner planets as well as specific characteristics of the four planets, as a class we will make a chart on the board about different characteristics of each. **Why:** Creating this visual aid will help the visual and auditory learns understand the important characteristics of inner planets. There is a lot of information in this lesson about the planets and by breaking it apart into inner and outer planets	**Monday** **What:** Finish reading the lesson about planets. This part of the lesson will focus on the outer planets. While reading about the characteristics of the outer planets and specific characteristics of those planets, we will build a chart as a class like the one from last week for inner planets. Students will complete a worksheet that asks them to find similarities and differences between the planets. **Why:** This will help the students build their understanding of specific characteristics of both inner and outer planets. The worksheet will help the students write what	**Tuesday** *Activity* – **MCM2** (2 worksheets about the planets) **What:** Students will partner up and complete two worksheets about the planets. The first part is matching that focuses on vocabulary from the section. The second part of the worksheet is a word search and identifying the four inner planets. The last part is a "who am I?" section about the outer planets. **Why:** This is an exciting assignment outside of the regular reading and lab activities where the students can work with a friend and complete fun short activities.	**Thursday** **What:** Students will read and comprehend the information about different ways to explore space. This lesson will contain information about telescopes, crewed missions and space probes. As we read students will make personal connections to what they know about telescopes and space missions that they have witnessed take off or read about. **Why:** This is an important lesson to understand how we know what we know about space. By having the students make personal connections to the

the students have more time to comprehend what they are learning without feeling overwhelmed. **E.ST.04.12, E.ST.04.11**	they know about the planets. Comparing and contrasting characteristics is a helpful way for students to assess their learning. **E.ST.04.12**	**E.ST.04.12**	information in the lesson, their learning becomes more meaningful. **E.ST.04.24**
Monday *Activity* – **CM3** (3 worksheets) **What:** The students will use a Venn Diagram to compare and contrast the Earth, Sun and Moon. The students will use this Venn Diagram to explain how the earth differs from the sun and the moon. **Why:** This is a great way for the students to visualize the similarities and differences between the Earth, moon and Sun. It is also a helpful resource to have when studying for their formal assessment. **E.ST.04.12**	**Tuesday** *Activity* – **MCM1** (moon phases chart) **What:** Review the moon observations and show the students the moon observations grid and explain Wednesday will be a new moon and show them how to document the different moon phases for the next two weeks. **Why:** By having the students document the different moon phases they can observe for themselves how the moon changes over a 28 cycle. **E.ST.04.24, E.ST.04.23, E.ST.04.12**	**Thursday** **What:** Formal Assessment for this Unit. The students will complete a concept map as a post-assessment for what they have learned through out the Unit. **Why:** The students will complete a concept map to diagram what they have learned through out the unit about the Sun, moon and the planets.	

Standards:

- **E.ST.04.11** – Identify the sun and moon as common objects in the sky.
- **E.ST.04.12** – Compare and contrast the characteristics of the sun, moon, and Earth, including relative distances and abilities to support life.
- **E.ST.04.21** – Describe the orbit of the Earth around the sun as it defines a year.
- **E.ST.04.22** – Explain that the spin of the Earth creates day and night.
- **E.ST.04.23** – Describe the motion of the moon around the Earth.
- **E.ST.04.24** – Explain how the visible shape of the moon follows a predictable cycle, which takes approximately a month.
- **E.ST.04.25** – Describe the apparent movement of the sun and moon across the sky through day/night and the seasons.

Activity Descriptions:

- *Creating a Concept Map* – Pre-Assessment: **Explain** – In this activity is part of the explain part of the instructional model because it is using a type of assessment to make adjustments to teaching. I asked the students to complete a concept map of facts they know about planets, the sun, the moon and Earth. By having the students complete this pre-assessment I can make adjustments to the topic areas I focus on based on their misconceptions.
- *Relative Size Investigation* – **Explore** – In this activity the students will investigate relative size with a basketball and tennis ball in comparison to the moon and the sun as we see them from Earth. This activity requires the students to investigate the distance between the tennis ball and basketball when they look the same size and when the tennis ball looks larger than the basketball. As the students record their observations they can use the data to draw conclusions about how relative size is distorted by distance.
- *Students Demonstrate the Orbit of the Earth and Moon* – **Explore and Explain** – In this activity the students are becoming the models for the investigation. In groups of 4, each student plays a role in the orbit of the Earth around the Sun and the Moon orbiting the Earth. The fourth student is explaining in their own words what is going on in the model, making sure they use key vocabulary, such as revolution, orbit, and rotation. This asks the students not only to design their own model of the different orbits but also explaining it in their own words.
- *How Planets Move Investigation* – **Explain** – In this activity the students are creating a visual model, using themselves, to show how the planets orbit the sun. As the other students observe their fellow classmates movement, they are looking to draw conclusions about planet movement and how quickly they orbit the sun based on their distance from the sun. The students are expected to make the conclusion that the closer the planet is to the sun the faster it will complete one revolution around the sun.
- *Distances Between Planets* – **CLASS LAB**
- *Venn Diagram* – **Apply** – In this activity the students are making connections between what they know about the Earth, Sun and Moon and how those characteristics are similar and different. As the students recall on facts they learned about the Earth, Sun and Moon through out the Unit, they are to see how they are similar or different by filling out the Venn diagram. This is also a great visual representation of what they have learned through out the Unit.
- *Moon Phases Chart* – **Engage and Apply** – In this activity the students are observing the different moon phases over a period of two weeks, starting the observations at the New Moon. This activity provides students with a hands-on experience to connect their learning to about the different moon phases. As they observe the pattern or phases of the moon, they are recording their observations and making connections to what they know about the Moon's orbit and what we see from Earth. This is a great way to get the students seeing the importance of their learning outside of the classroom.

Lesson for Class Lab:

- *Learning Goal:* Students will be able to make the connection between the distance from the Sun to the planet and the planet's orbit around the Sun.
- *Summary:* Students will create a scale model showing the distances between the planets. As they measure out the distances using the given scale they will create a representation of where the planets are located in our solar system. This will help them understand the learning goal with a hands-on experience.
- *Instructional Sequence & Lesson Function:* **Explore** – Students are using a scale model to investigate and record observations of the distances between planets and the connection to their orbit.
- *Supplies:* Copy of worksheet for everyone in class, string 4m long, 9 different colored markers and a meter stick for each group.
- *Expected time:* 45 minutes

Lesson Outline:

- *Introduction:* Ask the children if they remember the social studies lesson about map reading, more specifically if they remember what the scale on the map was and how to use it correctly. Explain to them that we are going to do the same thing for our activity today, create a scale model that shows the distances between planets in our solar system rather than distances between states on a map. By bringing a connection between what they learned in social studies to what they are learning in science the students will become engaged in their learning as they can make connections between the two learning experiences.
- *Activity:* Before passing out the materials for the lab, as a class we will read through the lab and each of the steps to the activity, therefore the students are not distracted by the materials on the table. After reading through the activity procedure together, we will look at the chart as a class, focusing on how to change the average distance from the sun in AU to our scale distance in cm. The first two measurements are done for them, as a class we will find the scale distance for Earth. After looking at the different components to the chart that the students must fill out, I will read through each of the drawing conclusions questions to let the students know what each question is asking of them. Question 1 is straightforward, for Question 2 I will tell the students to think of trying to measure the planets in our solar system with a meter stick, or in miles how difficult would that be and explain why that would be difficult. For a further example, I would ask the students how long would it take to measure a football field with a 12 inch ruler, then to measure the football field in yards, which would be easier. For Question 3, the students need to explain why it is important to use a scale model; can we actually make an accurate model of the distances between the planets? And finally, the students do not have to complete the investigate further question but they can complete it as a group for extra credit. After this, I will pass out the materials to the groups. Before the students begin, I will ask them 1 AU equals how many centimeters, to make sure the students know the conversion. Once the students receive their materials we will do step one together, tying the knot to make the sun. To create less confusion, the string will already be pre-cut into 4m for each group. After the students tie the knots, we will look at our meter sticks and I will show the students the side they are using for measurement, centimeters, on the meter stick.

- *Closing:* After the students have completed the lab activity, turned in their worksheet, and returned to their seats I will re-address the purpose of the activity as well as prepare them for the transition from this activity to the upcoming lesson. When we gather back as a class, first I will ask them what did they learn from this lab? Specifically, what can they tell me about the distance between the planets and their orbits? Also, how did creating a scale model help you visualize where the planets are in space? After the students answer these questions I will say tomorrow we will continue learning about the planets distances from the sun and how that affects their revolution or one complete orbit. After this the students will gather their belongings on their desk and will be dismissed to their lockers for lunch.

Adaptations and Community Concerns:

- *Adaptations:* Before assigning groups for this lab activity, I considered both reading and math skills along with their understanding of the science material. For some students I know the conversions from AU to cm would be very difficult, therefore they were placed in a group with a student who is strong in mathematics and can assist the student in the conversions. Some students also have difficulty reading in my class, therefore I paired them with students who not only are sharp readers but also are willing to help students who may be at a reading level below them.
- *Behavior Expectations:* In my classroom the rules are posted for group work. As a class we will review the rules that are relevant for this activity. One specific rule to point out is that everyone should get a turn measuring and marking a planet. Also no student should be dominating the group with the answers to the questions or bossing other students around during the measuring and marking. I will pick the groups based on the adaptations I made and therefore I will read off the groups and then the students can quietly move to their assigned group area when I finish reading. By assigning an area for the group to meet creates less confusion when it comes time to gather together. To gain the students attention or to quiet them down we have the two finger rule, when I put up two fingers in the air the students do the same and when their hand goes up their mouths close. The students are very familiar with this and therefore will follow the directions that come after. The two people who have the job of passing out paper will pass out the materials for the lab after we have gone through the lab together. After 35 minutes, I will call the students who have finished the lab to turn in their papers to the paper box and return their supplies to the front desk. The students' still working, I will remind them they have five minutes to finish up the activity.

Assessment:

- For this activity I will assess the students in two different ways. I will look at the work they turn in as well as how well they worked with their group and the amount of information they contributed. First, I will look at their worksheet, did they complete the chart, did they correctly complete the chart, and how did they answer the drawing conclusions questions. For the questions, I am not looking for a right or wrong answer; I am looking at how well the students explained their answers. To assess their group contributions, I will have the students fill out rubrics for the people in their group as well as while the students are working I

will walk around and observe how the students are interacting and contributing. I think how students interact in their group, is just as important, if not more important, to look at. Specifically, if one student is doing all the work while the other students are gossiping about the weekend. Therefore, both parts of the assessment will be weighed equally.

Lesson Tasks:

Task #1: Observe and record the moon phases over the course of two weeks.
Features:

1. Are they correctly observing the moon? **E.ST.04.24, E.ST.04.25**
2. Are they documenting the lit side of the moon? **E.ST.04.23**
3. Do they understand that reflecting the light from the sun lights only half of the moon? **E.ST.04.24**
4. Do they understand the orbit of the moon is over a course of roughly 28 days with different phases that we see every night? **E.ST.04.24, E.ST.04.25**
5. Do they understand that the first two weeks of the cycle, the amount of the lit side of the moon seen from Earth waxes, or increases? **E.ST.04.24**

Naïve Conceptions:

6. The moon looks the same every night.
7. No moon in the sky means that none of the moon is lit.
8. From the new moon until the second week the lit side of the moon is getting smaller.
9. Instead of being lit, we are seeing just pieces of the moon that disappear during the day.

Standards:
E.ST.04.23 – Describe the motion of the moon around the Earth.
E.ST.04.24 – Explain how the visible shape of the moon follows a predictable cycle, which takes approximately a month.
E.ST.04.25 – Describe the apparent movement of the sun and moon across the sky through day/night and the seasons.

Task #2: Create a concept map that shows the important information from the unit.
Features:

1. Focuses on the important details of Earth's moon. **E.ST.04.12, E.ST.04.23, E.ST.04.24, E.ST.04.25**
    - Moon is a natural satellite the orbits the Earth.
    - 28 days to complete one cycle.
    - Reflecting light from the Sun lights the moon.
    - Only half of the moon is lit.
2. Focuses on important details about Earth. **E.ST.04.12, E.ST.04.21, E.ST.04.22**
    - Earth orbits the sun. One complete orbit is a revolution that takes one year.
    - Earth is spins or rotates on its axis and complete one rotation in 24 hours, which causes night and day.
    - The tilt of the Earth on its axis as it revolves around the sun causes the seasons. Summer – Northern Hemisphere titled towards the sun. Winter – Northern Hemisphere tilted away from the sun.
3. Focuses on important details about the sun. **E.ST.04.12, E.ST.04.21, E.ST.04.25**
    - The Sun is a star, which is the center of our solar system.
    - The Sun is the source of almost all of the energy in our solar system. The energy reaches Earth as both heat and light energy.

- Planets orbit the Sun – the planets closer to the sun move faster around the sun than those planets that are further away from the sun.

4. Focuses on the important details about the planets. **E.ST.04.21**
    - Inner planets – rocky and dense; found between the Sun and the asteroid belt. (Mercury, Venus, Earth, and Mars)
        - Mercury – the size of Earth's moon. (no moons)
        - Venus – same size as Earth. (no moons)
        - Earth – only planet that supports life.
        - Mars – only inner planet with more than one moon.
    - Outer planets – large spheres made up mostly of gases; known as gas giants; have both moons & rings. (Jupiter, Saturn, Uranus and Neptune)
        - Jupiter – largest planet in our solar system
        - Saturn – known for its rings; at least 18 named moons
        - Uranus – blue-green ball of gas and liquid; at least 21 moons
        - Neptune – at least 8 moons; farthest away from the sun

Naïve Conceptions:

5. Earth orbits the moon.
6. The Sun is a planet.
7. The Sun orbits the planets.
8. All planets have moons.

Standards:

E.ST.04.12 – Compare and contrast the characteristics of the sun, moon and Earth, including relative distances and abilities to support life.
E.ST.04.21 – Describe the orbit of the Earth around the sun as it defines a year.
E.ST.04.22 – Explain that the spin of the Earth creates day and night.
E.ST.04.23 – Describe the motion of the moon around the Earth.
E.ST.04.24 – Explain how the visible shape of the moon follows a predictable cycle, which takes approximately a month.
E.ST.04.25 – Describe the apparent movement of the sun and moon across the sky through day/night and the seasons.

Task #1 Chart

Student	Feature #1	#2	#3	#4	#5	#6	#7	#8	#9
MA									
SA									
An B									
At B									
BB									
RC									
LC									
DF									
MH									
JH									
DH									
SJ									
RK									
MM									
SR									
TR									
SS									
AS									
AT									
DT									
MT									
CT									
OU									
SU									
SW									
AW									
KW									

*Check if the student showed the feature or naïve conception.

Task #2 Chart:

Student	Feature #1	#2	#3	#4	#5	#6	#7	#8
MA								
SA								
An B								
At B								
BB								
RC								
LC								
DF								
MH								
JH								
DH								
SJ								
RK								
MM								
SR								
TR								
SS								
AS								
AT								
DT								
MT								
CT								
OU								
SU								
SW								
AW								
KW								

*Check if the student showed the feature or naïve conception.

Analyzing the Charts:

- Most problematic feature:
    - Task #1: Understanding that we see the moon on Earth because it is reflecting light from the sun.
    - Task #2: Providing important details about Earth's moon.
- Goal features most often not present:
    - Task #1: Understanding that we see the moon on Earth because it is reflecting light from the sun and the orbit of the moon is over a course of roughly 28 days that result in different phases of the moon.
    - Task #2: Providing important details about Earth's moon as well as about Earth.
- Naïve features most present:
    - Task #1: No visible moon in the sky means that none of the moon is lit and we only see pieces of the moon that disappear during the day.
    - Task #2: The Sun orbits the planets and all planets have moons.

Evaluating the Unit:

- Assessment: Through out the unit I tried to constantly assess my students learning through different forms. Students were assessed with written assignments such as worksheets or review questions, verbal responses to question prompts through out the unit, a pre and post assessment asking the students to make a concept map of what they know about planets, Earth, Earth's moon and the Sun and a variety of lab activities assessing them on their responses as well as how they work in a group setting. The variety of assessments allowed me to judge my students learning based on different forms. For example, students who may have difficulty verbalizing their thoughts were able to show me what they knew by writing down there responses and vice versa. Also, the concept map allowed students to express what they knew and what they learned without constraints, with essay questions or multiple choice questions students can not be as creative with their learning nor can they guide their own like they can do with a concept map. These different types of assessments taught me that I have a variety of learners in my classroom and I need to constantly be giving students different ways to show me what they know because although a student may struggle with a written assignment they may know what is going on just not how to express it in writing. Overall, I felt my assessments were very successful in analyzing what my students already knew and what they learned after the unit was completed.
- Changes/Additions: One addition I would like to add to improve my evaluation of student learning would be one on one conferencing with the students. Although I allowed opportunities during class time for students to verbally express what they knew, some students are very shy and do not like speaking in front of the class therefore I was not able to assess their learning verbally. If I added one on one conferencing I could reach all the students individually in a more relaxed environment. A change in my analysis would be to keep a record of each student's progression through out the unit. Although there were adequate assessments through out the unit, I would have liked to have a chart the shows the students progression in their learning. There was a lot of information to cover in this unit and I think charting what the students learned through out the unit would be a great way to show the students how successful they were in the unit as well as specific areas that I may have needed to spend more time on.

Focusing on a Problem Area for the Lessons:

Problem: One problem that exists in my classroom that I would like to work on is students shouting out answers or questions without raising their hand or being called on. One of our classroom management rules is to raise your hand if you have something to say, but sometimes it can be difficult for the students to hold back their responses until being called on. I have noticed over the past few months that students are becoming a little too comfortable in our classroom where they tend to "bend" the rule a bit and because I have not addressed this issue as much as I should have it has become more of a problem. A few things that I have observed over the past two weeks that affect my students learning are: the students get frustrated when they have the right answer but are not called on and therefore want to shout out their answers or stop responding to other question prompts during class. Also, I have observed that the topics where students are more excited about and interested in, such as math and science, are the subject areas where the students do the most "shouting" because they constantly want to be the first one to say the right answer, not because they want to beat everybody else, but because they are excited they know what they are doing.

Not only is the shouting of answers a disruption to class instruction, it is also difficult for me to gauge the students learning who are more timid in class and less likely to shout out an answer. Also, the students who do raise their hands get frustrated when someone shouts out the answer because they felt confident in their response and wanted to claim the answer as their own rather than repeating another student's response. When it comes to specific science instruction I have observed, especially during the teaching of my unit, the students who had a strong background knowledge about our Solar System became frustrated early on with the students shouting out answers that they withdrew

from the lessons and from participating in class, not because they did not know the answers but because they were frustrated with the students who did not raise their hands. Another way in which this problem interferes with effective science learning is the difficulty in assessing my students learning through different mechanisms. It tends to be the same few students within the classroom that shout out answers, therefore it is difficult to assess the entire classes learning without doing written assessments or one-on-one interviews.

Intervention: In communicating with my cooperating teacher, I asked him ways in which I could approach this problem in my classroom to better the learning community. One strategy he suggested is that even if it slows down instruction; focus in on cracking down on the students who shout out answers during instruction. One way in which I will try to do this is explain to the students before beginning that we are going to be working on raising our hands to be called on rather than shouting out answers. I will tell the students that I want to be able to reward them for their own thoughts and therefore they need to raise their hands so they can get the proper acknowledgement. If at any point a student interrupts instruction by shouting out a question or answer, I will stop instruction and review the rules again. I will continue to complete this process until the students have a complete understanding of the rule. I think this will affect the learning community in a positive way and establish a strong community of learners. I believe this is one of the techniques that could help fix this problem because students need structure, and when I continue to address the same issue they understand that it is an important component of our classroom and therefore without abiding by this rule they are not apart of the community of learners. Another intervention is to reward the students who follow the

directions and raise their hands to be called on. A simple reward whether it is a sticker, candy or just a verbal reward, can be enough to see a change in students' behavior.

Result: In both communication with my cooperating teacher and analyzing my own teaching techniques I felt that my learning community has made changes over the course of this project but is still a work in progress. Through out this project, I observed more students raising their hands to be called on during instruction, and although there are still a few cases of student "outbursts" during class, they are fewer and less disruptive. I think it was important in the beginning for me to constantly address the issue and make students aware of the issue. I realized that a lot of the students did not realize they were actually being disruptive, therefore when the issue was addressed right away the students had the opportunity to adjust their behavior. One thing I noticed that still needs to be developed further is addressing the students who become frustrated when they do not get called on to give their answer. Although my students are not shouting out their answers as much, I can see the frustration in the students who have the correct answer but were not called on. This is one issue I hope to address over the last month of my internship.