Instructional Design

2nd Grade “Space”

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**Rationale**

Space is more than just looking into the night sky. People have always been interested in space and kids are no exception to this fact. Students of all ages gaze at the stars and the moon with wonder and amazement but teaching about these concepts is sometimes perplexing to children (Sherrod & Wilhelm, 2009). The concepts that students are learning in this unit will increase their awareness of the world and fulfill their need to understand the world and the “space” that is all around our world. This increased awareness will better help them to succeed in school and society.

It is extremely important to not only try to reach all students but push them towards excellence and understanding (Tomlinson, 2003). By including choices connected with differentiated instruction, students will discover many new facts and ideas about the stars, the sun, the moon, and the planets and the relationships between these concepts. For most students, space is a very abstract idea; they do not consider the fact that Earth is one planet in one solar system in one galaxy, etc. Students will learn that space is a very interesting concept with endless possibilities. They will be able to look at the world from a different perspective and understand a little more why the world is so unique. Students need to acquire the information presented in this unit to be able to connect multiple ideas and relationships.

It is critical to teach a unit that is exciting and interesting to students. State content standards still need to be covered each year, however, lessons could be focused around students’ interests as well. Students also enjoy learning through exploration of content and materials. The 5-E Learning Cycle Model used in this instructional design fits well with the topic of Space while allowing the students to explore and “play”. The 5-E Learning Cycle Model works very well with science lessons because it has strong linkage to constructivist theories of teaching and learning (Chiarelott, 2006). Because in constructivist classrooms, the emphasis is on the learners perceptions, the 5-E model can coexist quite well in this type of classroom.

**Space- Science Subunit Learner Outcomes**

Evaluation

* Students will be able to describe why they think the moon has phases each month.
* Students will be able to defend and support, in writing, why people have only been found to live on Earth and not any other planets.

Synthesis

* Students will be able to explain the fact that there are more stars in the sky than anyone can easily count.
* Students will be able to explore flashlights and shadows for an experiment and reconstruct the movement of the Earth, sun, and moon.

Analysis

* Students will be able to differentiate between the phases of the moon.
* Students will be able to compare and contrast the planets and their characteristics.

Application

* Students will be able to apply knowledge of the apparent movement of the sun, moon, and stars to complete an experiment.
* Students will be able to demonstrate appropriate safety procedures when completing scientific investigations.
* Students will be able to demonstrate use of appropriate tools and simple equipment/instruments to safely gather scientific data during experiments.
* Students will discover that in science it is helpful to work with a team and share findings with others.

Comprehension

* Students will be able to explain that animals, people, and plants all have certain needs that can only be found on Earth.
* Students will be able to identify and give an example of the planets and their characteristics.

Knowledge

* Students will be able to recognize and observe the stars.
* Students will be able to describe that the stars appear to move across the sky.
* Students will be able to describe that the moon appears to move across the sky.
* Students will be able to describe that the sun appears to move across the sky.
* Students will be able to observe and describe how the moon appears a little different every day but looks nearly the same again about every four weeks.

**Pre-Assessment**

The pre-assessment for this subunit will be conducted in the form of a KWL chart. I chose to use a KWL chart with pre-identified questions because it will target specific information learned throughout this unit without the use of an actual paper/pencil test. Also, it is a very comprehensive chart that will be hanging up throughout the teaching of the subunit so that the class can see it. This will allow students to relate back to what they knew prior to learning this subunit and what they know after learning this subunit. This will help the students reflect on the knowledge that they have gained. I will evaluate the information that is filled in on the chart by adjusting my lesson plans if necessary to what the students might have already mastered and any misconceptions, while also trying to include information that they are interested in knowing about. (I have not provided answers to this pre-assessment because it is completed based off of interactions with the students.)

One week prior to starting this unit, create a KWL chart with the students on the chart board paper. Remind students that the “K” stands for KNOW, the “W” stands for WANT TO KNOW, and the “L” stands for LEARN. Tell students that we will be filling in the “K” and “W” sections of the chart prior to starting this subunit and we will be filling in the “L” section when we have finished the subunit. Explain that we are filling this out so that I can get to know what they already know about this topic and what they want to know so I can try to include some of it during instruction. Also, remind students that we can see how much we learned at the end of the subunit by comparing the “K” column and “L” column. Start by filling in the “K” section. When filling in the “K” section, ask students the following questions:

* Why does the moon not always look like the same shape when we see it in the sky?
* What do you know about the phases of the moon?
* Why isn’t the moon always in the same spot when we see it in the sky?
* Why isn’t the sun always in the same spot when we see it in the sky?
* Are the stars always in the same spots when we see them in the sky? Why?
* How many stars are there?
* What are the names of the planets?
* What do you know about the planets?
* Do people live on any other planet besides Earth? Why?

After I have finished asking these questions, ask the students what else they would like to know. Fill in this information in section “W”.

**Lesson Plans**

I have included three lesson plans from this subunit.

Lesson 1

Time Frame: 45 minutes

**I. CONCEPT/SKILL TO BE LEARNED**

Stars

**II. LESSON OBJECTIVES**

Students will be able to recognize that there are more stars in the sky than anyone can easily count.

Students will be able to recognize that the stars are always in the sky and that they just can’t always see them.

**III. PROCEDURES**

**A. ENGAGEMENT:** 7 minutes

* *Hello boys and girls. We are going to start off by doing a picture walk in a book to give us a little background information on what we are going to be learning about today.*
* Teacher will show cover of the book and flip through the pages with pictures on them, Stars: Near and Far by Robin Dexter.
* Teacher will ask students questions about the book.
  + From looking at the cover, what do you think this book is going to be about?
  + What do you see in the night sky?
  + What do you want to know more about with this book?
* *When I take a picture walk through this book, I see that there is a lot more to stars than I originally thought.*
* *Well, today we are going to learn about the stars.*
* Have students talk within their tables about what they think the pictures mean in this book to them.
* *Would you enjoy listening to someone talk about the stars or actually looking at the stars more?*
* *I would enjoy looking at the stars more. I actually sit outside sometimes and just stare at the sky because I have always been fascinated with the sky.*

**B. EXPLORE:**  12-15 minutes

* *Okay I am going to pass out this worksheet now. Do not put your name on this paper.*
* *I want you to fill this out individually. Please do not work with anyone else.*
* *Read the paragraph and each student’s statement and write down which student’s statement you agree with most and why you think that answer is the best. No one will be penalized if the answer you pick is incorrect so please be honest. Remember our names are not on this paper so no one will know which answer you picked.*
* Students will have 5 minutes to read the paper and fill it out.
* *Now I want you to crumple that paper into a ball. Yes, crumple it up.*
* *Okay, throw your crumpled up paper across the room to someone else. Keep throwing the papers around until I say stop. Be sure not to throw the paper at anyone else.*
* *STOP! Okay everyone find one paper and open it up.*
* *We are going to look at the answer on the paper in front of us, not the paper we filled out. If the answer on your paper says Jack go over to the doorway. If the answer on your paper says Shelley go over to the gathering rug. If the answer on your paper says Nancy go stand by the math table. If the answer on your paper says Emma go stand by the reading groups table. And finally, if the answer on your paper says Flavio stand in the middle of the room behind the laptop.*
* *Good. Did everyone find the place they are supposed to be standing? Okay, share the answers on your papers within the group you are standing with.*
* Students have 5 minutes to talk within their small groups about the answers on the page they are holding.
* Teacher announces for everyone to come to the gathering area for a large group discussion.

**C. EXPLAIN:** 13 minutes

* *Did you know that there are more than 200 billion billion stars? Most of these stars we cannot even see because they are so far away. Okay, let’s read the book we took a picture walk through earlier to find out more about the stars.*
* Teacher will read book, Stars: Near and Far aloud to students.
* On page 1 ask students if they have ever seen stars in the night sky.
* On page 19 ask students if they know of any stars that are in specific shapes or that look like people or things.
* *This book tells us that there are so many stars in the sky that we could never count them in our lifetime.*
* *The book did not say what shapes stars actually are. Does anyone know what shape stars are? Do you think they actually look like the stars I put on your paper when I grade them?*
* After a few students give their opinions, explain to students that stars are actually round like the earth and the sun.
* *After reading the book about stars, would anyone like to change the answer they picked on the worksheet? Just raise your hands; please don’t shout out at me.*
* Call on a few students to see which statement they agree with most and how do they know that answer is the best one.
* *The most correct statement on the worksheet is Shelley’s. “The stars are still in the sky above us, but we can’t see them.”*

**D. EXTEND:** 2-3 minutes

* All students will go back to their seats.
* Teacher will ask students to get out their writing notebooks.
* *Sometimes the stars are in the shape of animals or people.*
* Explain that these are constellations and ask students if they know of any constellations. If they do, draw the constellation and write 3 sentences about how they know of this constellation and what they know about it. If they do not, have them create one and write about why they chose that constellation.

**E. EVALUATE:** 2-4 minutes

* Teacher asks students
  + Can we ever easily count all of the stars in the sky?
* Students will be asked to put their hands on their head if they think we cannot easily count all of the stars and put a finger on their nose if they think we can easily count all of the stars in the sky.
* Teacher will need to individually work with students after class who put their finger on their noses to help them to understand that there are more stars in the sky than we could ever easily count.

**CLOSURE** 2-4 minutes

* *Today we learned about stars. Can someone raise a quiet hand to tell me one thing we learned about stars?*
* Let students share a few findings to the class.
* *Tomorrow we are going to learn more about space and the sky.*

**IV. MATERIALS/RESOURCES**

* Where Do Stars Go? Worksheet (Uncovering Student Ideas in Science textbook)
* Pencil
* Stars: Near and Far by Robin Dexter



Lesson 2

Time Frame: 40 minutes

**I. CONCEPT/SKILL TO BE LEARNED**

Stars, Sun, and Moon: Apparent Movement

**II. LESSON OBJECTIVES**

Students will be able to describe how the sun, moon, and stars all appear to move slowly across the sky.

**III. PROCEDURES**

**A. ENGAGEMENT:** 10 minutes

* *Hello class. Can anyone tell me what we learned about yesterday in Science class?*
* Let students with a quiet raised hand offer answers.
* *Correct, we learned about stars and how there are way too many stars in the sky to ever easily count.*
* *Alright, let’s go outside for a few minutes.*
* Take students outside and ask questions.
  + Where is the sun? Please point at it.
  + Where do you think the sun will be at lunchtime?
  + Where do you think the sun will be a dinnertime?
  + Where does the sun go when we are in bed?
  + Where will the sun be tomorrow morning?
  + Does it always rise on the same side?
  + Are the stars always in the same place?
  + What about the moon?
* Today we are going to be learning about how the sun, moon, and stars all appear to move in the sky.
* Students all return back to the classroom.

**B. EXPLORE:** 10 minutes

* Have students act out the following in tabled groups.
  + Have a “sun” in one location for each group.
    - A student will pretend to be the sun.
  + Have an “earth” in another location for each group.
    - Another student will pretend to be earth and demonstrate how they think the sun changes position in the sky.
* Students will take turns with in their groups rotating and moving how they think the sun and earth move.

**C. EXPLAIN:** 15 minutes

* Call student’s attention and explain the way the “earth” and “sun” should be moving.
* *The sun stays in one place while the earth will be moving. The student who is going to be the earth needs to stand so their right side is facing the sun.*
* “Direct students to use their right arm to point to the sun. Have students slowly rotate to the right, continuing to point at the sun.”
* “Direct students to stop when facing the sun (noon).”
* *Did your arm stay in the same position? Think about what that means.*
* Have students pair up to think about their findings. Do a think/pair/share within the paired groups on these questions.
  + *“Does the sun appear to move?*
  + *What is really moving?*
  + *What does this mean?*”
* *Let’s take a picture walk in this book called What Makes Day and Night.*
* Teacher will show cover of the book and flip through the pages with pictures on them.
* Teacher will ask students questions about the book.
  + From looking at the cover and the title, what do you think this book is going to be about?
  + What do you already know about the night sky?
  + What else would you like to know?
  + What do you want to know more about from this book?
* *When I take a picture walk through this book, I see that there is a lot more in space than the stars we started learning about yesterday. What do you see?*
* Have students talk within their tables about what they think the pictures in this book mean to them.
* Read the book aloud to students.
* On page 22-23, ask students if our experiment worked the same as the children in the book.
* On page 29, ask if they would rather live here on earth or on the moon.

**D. EXTEND:**

* Students will make an accordion book with notes and observations of what we are learning about if enough time is available today.

**E. EVALUATE:**

* Students will be assessed through informal observations of
  + The “sun” and “Earth” activity.
  + Question and Answer sessions throughout the day.

**CLOSURE** 5 minutes

* *Today we learned about how the stars, sun, and moon all appear to move across the sky. Can someone raise a quiet hand to tell me something they learned about why the sun, moon, and stars all look like they are moving?*
* *Are they really moving though?*
* Let students share a few things we learned today.
* *Tomorrow we are going to learn more about how the sun, moon, and stars all appear to move in the sky.*

**IV. MATERIALS/RESOURCES**

* Pencil
* What Makes Day and Night by Franklyn M. Branley
* Paper

Lesson 3

Time Frame: 40-45 minutes

**I. CONCEPT/SKILL TO BE LEARNED**

Moon’s Phases

**II. LESSON OBJECTIVES**

Students will be able to observe and describe how the moon appears a little different every day but looks nearly the same again about every four weeks.

**III. PROCEDURES**

**A. ENGAGEMENT:** 5 minutes

* + *Hello class. If I said we were going to eat cookies today in science class, would you believe me?*
  + *Well, we are going to continue our learning today with the moon’s phases and we just might eat a few cookies to help us do that.*
  + *Can someone raise a quiet hand to tell me one thing we learned about the moon yesterday in class?*
  + *Did anyone see the moon last night before they went to bed?*
  + *What did it look like? Which phase would that be in?*

**B. EXPLORE:** 15-20 minutes

* Pass out the foldable paper for the moon phases.
* Tell children to fold the paper into fourths and then open up the paper and lay it flat on their desks.
* Pass out the baggies of Oreos and inform students that they are not to eat these because we are using them in class today. They each get their own baggie and they are not to share. The students are to take 1 cookie out at a time to work with, not empty the whole bag on the desk.
* Model with students how to bite each cookie and trace in it the squares on the paper to look like the moon’s phases.
  + Trace a whole cookie in box 1 and shade in the entire circle.
  + Label it New Moon.
  + Bite along the left side of the next cookie carefully so it looks like a backwards C.
  + Trace that into the second box and label it Waxing (Growing) Crescent.
  + Bite cookie 3 in half and trace it in the 3rd box.
  + Label it First Quarter Moon.
  + Bite along the right side of the next cookie so that it looks like a C and trace it in the 4th box.
  + Label it Waxing Gibbous.
  + Flip the paper over and trace a whole cookie in box 5.
  + Do not fill in this cookie and label it Full Moon.
  + Flip over the cookie used in box 4 and trace it into box 6.
  + Label it Waning (Shrinking) Gibbous
  + The cookie from box 3 will become the Last Quarter moon in box 7.
  + Flip the cookie over so that it is facing the left and trace it.
  + Use the cookie from box 2 for the Waning Crescent in box 8.
  + Flip the cookie over and trace it.
* Students may now eat their cookies or place them back in the baggie.

**C. EXPLAIN:** 10 minutes

* Explain that everyone’s cookie moon phases are going to look a little bit different.
* Inform students that this is one of the reasons why scientists review each other and ask questions; because doing the same thing sometimes does not always give the same result.
* Collect the foldable papers to grade.
* Pass out the Circle Diagram tool and tell students to draw a picture in each square representing a moon phase.
* Collect this when students are finished so it can be put with the foldable paper for each child to be graded together.

**D. EXTEND:**

* Students can keep a log for homework of the moon. Students will draw what the moon looks like each night for one month and label each page with the date.

**E. EVALUATE:**

* Students will be evaluated by the two completed projects turned it today.

Foldable Paper Rubric

8- Papers are complete. Papers are correctly labeled with tracings in each box.

7- Papers have 7 phases correctly traced and labeled.

6- Papers have 6 phases correctly traced and labeled.

5- Papers have 5 phases correctly traced and labeled.

4- Papers have 4 phases correctly traced and labeled.

3- Papers have 3 phases correctly traced and labeled.

2- Papers have 2 phases correctly traced and labeled.

1-Papers have 1 or less phase correctly traced and labeled.

Circle Diagram Tool Rubric

8- All 8 pictures are drawn in correctly.

7- 7 pictures are drawn in correctly.

7- 6 pictures are drawn in correctly.

5- 5 pictures are drawn in correctly.

4- 4 pictures are drawn in correctly.

3- 3 pictures are drawn in correctly.

2- 2 pictures are drawn in correctly.

1- 1 or less pictures are drawn in correctly. Students did not try.

**CLOSURE**  7-10 minutes

* *Today we continued our learning about the moon’s phases.*
* *Does anyone have any questions about what we learned today?*
* Give students time to comment and question.

**IV. MATERIALS/RESOURCES**

* Oreos
* Baggies
* Paper Towels/Napkins
* Pencil/Crayons/Markers
* Smart Board
* Circle Diagram Tool Worksheet
* Foldable Paper for cookies (Take one sheet of computer paper. Cut it in half “long ways” and tape it together. Fold it so there are enough sections for the phases of the moon.)

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Circle Diagram Tool: Moon Phases

Directions: Draw a picture of the moon’s phase in each box.

**Post Assessment**

The post-assessment for this subunit will be conducted in two ways. The first way is filling out the “L” section of the KWL chart that was used with the pre-assessment; the second way is a written assessment. Completing the KWL chart will be done on the same chart paper that the pre-assessment used so that the students can see and reflect on the knowledge gained. This will help me to gauge what they students have learned and will also help the students wrap up the learning and knowledge from the entire subunit. For the written assessment, the students will be asked a series of questions about the content learned throughout this subunit. This will allow me to evaluate the individual growth of each student while also analyzing if certain students (or the whole group) needs more instruction with specific areas.

The KWL will be evaluated based upon student understanding and completeness of answers. The written assessment will be evaluated with a point system. There are 10 points total. One point will be given for each correct true/false answer and two points for each written short answer. (Answers are provided for the true/false questions. I did not detail answers for the written responses because they will differ for each child.)

KWL Chart

The day after the subunit has been completed, point out the KWL chart that we started before the first day of this unit. Read over what was written in the “K” section of the chart. Tell the students that I am going to ask them the same questions I did to fill in the “K” section, only this time we are going to fill in the “L” section to see if we have learned more about these questions. One by one, go over the following questions:

* Why does the moon not always look like the same shape when we see it in the sky?
* What do you know about the phases of the moon?
* Why isn’t the moon always in the same spot when we see it in the sky?
* Why isn’t the sun always in the same spot when we see it in the sky?
* Are the stars always in the same spots when we see them in the sky? Why?
* How many stars are there?
* What are the names of the planets?
* What do you know about the planets?
* Do people live on any other planet besides Earth? Why?

Try to clear up any confusion and figure out if the students still have misconceptions while filling in this chart. If necessary, re-teach portions of the content that the students haven’t mastered yet.

Written Assessment

The next day after the completion of the KWL chart, tell students that it is time for our science space test. Hand out a paper test to each student and go over the directions with them. Be sure to inform them that this is going to be done individually so I can see what they have learned and that they should not be working with a friend to get the answers. Collect the tests when the students have finished.

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**Space Science Written Assessment**

Directions: Fill in the answer for each question by writing true or false on the line.

1. \_\_\_\_\_\_\_ There are more stars in the sky than we could ever count. (True)
2. \_\_\_\_\_\_\_ People live on Mars. (False)
3. \_\_\_\_\_\_\_ Earth is the only planet that we know has plants and trees. (True)
4. \_\_\_\_\_\_\_ The moon is made out of cheese. (False)

Directions: Fill in the answer for each question. Include as many details as possible. Use at least 2 sentences to answer each question

1. Pick one of the planets we learned about not counting Earth. Tell me what you know about that planet.

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1. Why do the sun, moon, and stars all appear to move across the sky?

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1. Why does the moon appear to change shape?

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