Pace
Charter School of Hamilton

Science Curriculum

Grade 1

The Mission

Our mission is to cultivate science learners who have the foundational knowledge to make ethical, scientifically literate decisions and the ability to apply scientific practices in order to contribute to the needs of society and a changing world.

- **Vision**

  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:

  - *Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.*
  - *Emphasize authentic science and engineering practices and leverage the interdisciplinary nature of science with arts, technology, math, reading, and writing.*
  - *Integrate scientific knowledge and 21st century competencies to prepare students to make informed decisions and take action to address real world problems.*

Patterns of Change in The Sky: Grade 1

Appendix A: NGSS and Foundations for the Unit
Use observations of the sun, moon, and stars to describe patterns that can be predicted. *[Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.]* [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.*]* **(1-ESS1-1)**
Make observations at different times of year to relate the amount of daylight to the time of year. *[Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.]* [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.*]* **(1-ESS1-2)**
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations ● Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Planning and Carrying Out Investigations** ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) **ESS1.B: Earth and the Solar System** ● Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2) - ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ● Science assumes natural events happen today as they happened in the past. (1-ESS1-1) ● Many events are repeated. (1-ESS1-1)

Lesson Plans

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 1 **in a series of** 13 **lessons** Introduction to the Sun and Pre-Assessment
Brief Lesson Description: In this lesson, students will be taking a pre-assessment to demonstrate prior knowledge about patterns in the sky.		

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Identify the Sun, Earth and Moon as permanent objects in the sky.

By the end of this lesson, students will understand:

- The Sun is larger than the Earth and Moon.
- The Earth is larger than the Moon.
- The Sun, Earth and Moon are permanent objects in the sky and are from nature and not man-made.

Narrative / Background Information

Prior Student Knowledge:
This is the first opportunity for students to encounter these ideas.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Pre-Assessment
- Teacher observations

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 2 **in a series of** 13 **lessons** Observing the Sun

Brief Lesson Description: In this lesson, students observe and gather data about the sun.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Observe and describe patterns in the sun's movement.

By the end of this lesson, students will understand:

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.

Narrative / Background Information

Prior Student Knowledge:
This is the first opportunity for students to encounter these ideas.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The Moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on Earth has seasons at the same time.

EVALUATE:

- How does the Sun's path across the sky change your shadows?

Formative Monitoring (Questioning / Discussion):

- Teacher Observations
- Student's science notebooks/recording sheet

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 3 **in a series of** 13 **lessons** Analyzing Shadows and Data

Brief Lesson Description: In this lesson, students observe, describe, and predict some patterns in the movement the sun in the sky.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Observe and describe patterns in the sun's movement by analyzing data.

By the end of this lesson, students will understand:

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.

Narrative / Background Information

Prior Student Knowledge:

Students will use their knowledge and observations of shadows that they used in the previous lesson.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Teacher Observations.
- Student Work - Foldable

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 4 **in a series of** 13 **lessons** Understanding Day and Night- Rotation and Revolution

Brief Lesson Description: In this lesson, students will understand the relationship between the Earth and Sun.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
- Describe that the Sun's path across the sky is due to the Earth's motion, not the Sun's.

By the end of this lesson, students will understand:

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.
- The Earth is an object that revolves around Sun.

Narrative / Background Information

Prior Student Knowledge:

Students have learned that the sun is a permanent object in the sky and that it travels in a pattern across the sky.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):
Teacher Observations.
Student Discussion.

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 5 **in a series of** 13 **lessons** Introduction to the Moon

Brief Lesson Description: In this lesson, students will use models of the moon, sun, and earth to investigate why the moon has phases.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
- Describe patterns of the moon and understand that the moon is an object that revolves around the earth.

By the end of this lesson, students will understand:

- The moon is an object that revolves around Earth.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.

Narrative / Background Information

Prior Student Knowledge:
This is the first opportunity for students to encounter these ideas.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3) **Planning and Carrying Out Investigations** ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Student discussions
- Teacher observations

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 6 **in a series of** 13 **lessons** Phases of the Moon

Brief Lesson Description: In this lesson, students will use ipads to explore how long the moon takes to complete a phase.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
- Describe patterns of the moon.

By the end of this lesson, students will understand:

- The moon is an object that revolves around Earth.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.

Narrative / Background Information

Prior Student Knowledge:

The students have learned that the moon has phases.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2) ***Connections to Nature of Science*** **Scientific Knowledge Assumes an Order and Consistency in Natural Systems** ● Science assumes natural events happen today as they happened in the past. (1-ESS1-1) ● Many events are repeated. (1-ESS1-1)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Students' Phases of Moon Recording Sheet
- Teacher observations

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 7 **in a series of** 13 **lessons** Moon Data

Brief Lesson Description: In this lesson, students will create a model of the moon out of modeling clay.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Use models to describe patterns in the natural world in order to answer scientific questions.
- Create a model to represent the moon.

By the end of this lesson, students will understand:

- The moon is an object that revolves around Earth.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.

Narrative / Background Information

Prior Student Knowledge:

Students have learned that the moon is an object that revolves around the earth and the moon changes phases as time goes by.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on Earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Student's moon model
- Teacher observations

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 8 **in a series of** 13 **lessons** Spatial Relations of the Earth, Sun, and Moon

Brief Lesson Description: In this lesson, students describe and predict some patterns in the movement of the Sun, Earth and Moon.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
- Describe patterns of the sun, earth, and moon's movement.

By the end of this lesson, students will understand:

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.
- The moon is an object that revolves around Earth.

Narrative / Background Information

Prior Student Knowledge:
The students have learned that the sun and moon are both permanent objects in the sky.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:
- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):
- Teacher observations
- Student discussions

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 9 **in a series of** 13 **lessons** Understanding Stars

Brief Lesson Description: In this lesson, students describe some patterns in the stars.

Performance Expectation(s):
- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:
By the end of this lesson, students will be able to:
- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)
- Describe patterns of the stars and understand that because the sun is so close, its brightness keeps us from seeing other stars during the day.

By the end of this lesson, students will understand:
- Because the Sun is so close, its brightness keeps us from seeing other stars during the day.

Narrative / Background Information

Prior Student Knowledge:
This is the first opportunity for students to encounter these ideas.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

Teacher observation and notes

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 10 **in a series of** 13 **lessons** Patterns of Daylight

Brief Lesson Description: In this lesson, students observe, describe, and predict some patterns in the movement of the Sun in the sky.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

By the end of this lesson, students will understand:

- The Sun appears to be higher in the sky during the summer and lower in the winter due to Earth's tilt and revolution around the sun.

Narrative / Background Information

Prior Student Knowledge:

The students have learned that the sun moves in a pattern across the sky.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) **ESS1.B: Earth and the Solar System** ● Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The Moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on Earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Teacher Observations and Notes

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 11 **in a series of** 13 **lessons** Introduction to the Seasons- Tilt of the Earth and Earth's revolution around the sun to make the seasons

Brief Lesson Description: In this lesson, students will be able to understand how the movement of the earth makes the seasons.

Performance Expectation(s):

- Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1)
- Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)

Specific Learning Outcomes:

By the end of this lesson, students will be able to:

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

By the end of this lesson, students will understand:

- Seasons are caused by the Earth's tilt and the revolution of the earth around the sun.
- The Sun appears to be higher in the sky during the summer and lower in the winter due to Earth's tilt and revolution around the Sun.

Narrative / Background Information

Prior Student Knowledge:

The students have learned that the sun moves in a pattern across the sky.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) **ESS1.B: Earth and the Solar System** ● Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	**Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

Teacher Observations and Notes.
Student Work.

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 12 **in a series of** 13 **lessons** The Four Seasons
Brief Lesson Description: In this lesson, students will describe the four seasons.		
Performance Expectation(s): ● Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1) ● Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)		
Specific Learning Outcomes: By the end of this lesson, students will be able to: ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1) ● Identify and describe the four seasons. By the end of this lesson, students will understand: ● Seasons are caused by the Earth's tilt. ● The Sun appears to be higher in the sky during the summer and lower in the winter due to Earth's tilt and revolution around the sun.		
Narrative / Background Information		
Prior Student Knowledge: The students have learned why the earth has seasons.		
Science & Engineering Practices: **Planning and Carrying Out Investigations** ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)	**Disciplinary Core Ideas:** **ESS1.A: The Universe and its Stars** ● Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1) **ESS1.B: Earth and the Solar System** ● Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)	**Crosscutting Concepts:** **Patterns** ● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)
Possible Preconceptions/Misconceptions: ● The Earth is the center and the Sun rotates around the Earth. ● The moon gives off its own light. ● The Earth is the biggest planet. ● Daylight time is the same throughout the year. ● Everybody on Earth has daytime/nighttime at the same time. ● Everybody on earth has seasons at the same time.		
EVALUATE: **Formative Monitoring (Questioning / Discussion):** Teacher Observations and Notes Student Work - Science Notebook or response sheet		

Grade/ Grade Band: 1st grade	**Topic:** Patterns of Change in the Sky	**Lesson #** 13 **in a series of** 13 **lessons** Assessment/Final Project/Culminating Activity
Brief Lesson Description: In this unit of study, students observe, describe, and predict some patterns in the movement of objects in the sky.		
Performance Expectation(s): ● Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1) ● Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2)		
Specific Learning Outcomes: SWBAT demonstrate their knowledge of patterns of change in the sky. By the end of this unit, students will be able to:		

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

By the end of this unit, students will understand:

- How the Sun appears to travel across the sky and that this is due to the Earth's motion, not the Sun's.
- The moon is an object that revolves around Earth.
- The Moon shines because it is reflecting sunlight.
- The Moon appears to grow and shrink in the sky based on how much reflected sunlight we can see.
- Because the Sun is so close, its brightness keeps us from seeing other stars during the day.
- Seasons are caused by the Earth's tilt.
- The Sun appears to be higher in the sky during the summer and lower in the winter due to Earth's tilt and revolution around the sun.

Narrative / Background Information

Prior Student Knowledge:

The students have explored the relationship between the earth, sun, and moon. The students have also learned about the four seasons and why the earth has seasons.

Science & Engineering Practices:

Planning and Carrying Out Investigations

- Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(1-PS4-3)

Planning and Carrying Out Investigations

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Analyzing and Interpreting Data

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

Disciplinary Core Ideas:

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

Crosscutting Concepts:

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

- -

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past. (1-ESS1-1)
- Many events are repeated. (1-ESS1-1)

Possible Preconceptions/Misconceptions:

- The Earth is the center and the Sun rotates around the Earth.
- The moon gives off its own light.
- The Earth is the biggest planet.
- Daylight time is the same throughout the year.
- Everybody on Earth has daytime/nighttime at the same time.
- Everybody on earth has seasons at the same time.

EVALUATE:

Formative Monitoring (Questioning / Discussion):

Summative Assessment (Quiz / Project / Report):

Sample of Open Education Resources

The Dynamic Trio: In this lesson, students will learn about the stars, planets, and moons found in our solar system and how they relate to one another. The video segment enhances the learning. After a non-fiction read aloud, students work in groups to create models of the Solar System.

Our Super Star: This is a three part lesson where students use observations, activities, and videos to learn basic facts

about the Sun. Students also model the mechanics of day and night and use solar energy to make a tasty treat. One of the videos is a time-lapse video of a sunrise and a sunset.

Keep a Moon Journal: The National Wildlife Federation's "Keep a Moon Journal" page allows students to get acquainted with the phases of the moon by keeping a moon journal to record their nightly observations for one month. The page has links to diagrams, a student printable, and activities connecting the journal to other content. The page is set up as a "family activity" and could be used as nightly homework for students then discussed weekly in class.

Patterns of Daylight: This is a mini-unit that can be taught directly after Space Part 1or independently. The author chose to teach the Space Part 1 unit (also available on Better Lesson! at http://betterlesson.com/lesson/613469/introduction-and-pre-assessment) during January, and follows up at the end of the year in a recap in May. This lesson uses prior student knowledge and a video simulation.

Observing the Sun: This lesson is an activity where students create a sun tracker and monitor the sun's position over the course of a day. Examples of student journals and connections within a larger unit are provided.

Teacher Professional Learning Resources

Teaching NGSS in Elementary School—First Grade

The presenters were Carla Sembal-Saul, Professor of Science Education at Penn State University, Mary Starr, Executive Director at Michigan Mathematics and Science Centers Network, and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education and NGSS Curator introduced the *NGSS* Web seminar Series for K-5 educators.

After a brief overview of this *NGSS* for First Grade web seminar, Mary discussed the science and engineering practices in relation to teaching first grade. The web seminar focused on the concept of sound, and how performance expectations should be incorporated into teaching. Sound was further considered as a disciplinary core idea within first grade teaching. Participants viewed a video of a teacher supporting students in developing towards the performance expectations. The science and engineering practices of explanation and argument was considered within the lesson presented. Claim, evidence, reasoning and rebuttal were discussed, and a CER framework was shared. Carla introduced the KLEWS chart and discussed its use in an elementary classroom. Kathy shared the importance of classroom discourse and science talk. The web seminar closed with the sharing of resources in relation to the NGSS and teaching K-5 grades. Ted, in closing, shared NSTA resources in relation to the NGSS.

Visit the resource collection.

Continue discussing this topic in the community forums.

NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence

Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena.

To view related resources, visit the resource collection.

Continue discussing this topic in the community forums.

NGSS *Core* Ideas: Earth's Place in the Universe

The presenter was Julia Plummer from Penn State University. The program featured strategies for teaching about Earth science concepts that answer questions such as "What goes on in stars?" and "What patterns are caused by Earth's movements in the solar system?"

Dr. Plummer began the presentation by discussing what students should know about the disciplinary core idea of Earth's Place in the Universe. She talked about using the scientific and engineering practices to help engage students. Participants shared their ideas about applying this core idea to the classroom, and then Dr. Plummer shared strategies for effective instruction. She also discussed the importance of spatial thinking for students to begin thinking scientifically about these concepts.

Continue the discussion in the Community Forums.

Connecting with English Language Arts/Literacy and Mathematics

English Language Arts/Literacy

In this unit of study, students need opportunities to participate in shared research and writing projects about patterns of change in the sky. For example, students can use online resources or books to research the patterns of change that are visible over time when we observe the objects in the sky. With guidance from adults, students could create books that describe and illustrate the different patterns of change observed in objects in the sky. They could also describe and illustrate the relative amount of daylight in relation to the season using a sequenced set of journal entries or in a sequence-of-events foldable.

Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions). (1-ESS1-1),(1-ESS1-2) **W.1.7**

With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question. (1-ESS1-1),(1-ESS1-2) **W.1.8**

Mathematic

Students need opportunities to represent and interpret data and to use addition and subtraction. The following examples from NGSS Appendix L could provide guidance for instruction and should be done with teacher support:

- ☐ Science example 1: There were 16 hours of daylight yesterday. On December 21, there were 8 hours of daylight. How many more hours of daylight were there yesterday than on December 21?
- ☑ Science example 2: Based on the data collected and posted on the bulletin board so far, which day has been the longest of the year so far? Which day has been the shortest?

Reason abstractly and quantitatively. *(1-ESS1-2)* **MP.2**

Model with mathematics. *(1-ESS1-2)* **MP.4**

Use appropriate tools strategically. *(1-ESS1-2)* **MP.5**

Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem. *(1-ESS1-2)* **1.OA.A.1**

Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another. *(1-ESS1-2)* **1.MD.C.4**

21st Century Life and Careers/Technology Standards (as applied at grade level):
● Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. ● Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. ● Communicate clearly and effectively and with reason. ● Utilize critical thinking to make sense of problems and persevere in solving them. ● Employ valid and reliable research strategies. ● Demonstrate creativity and innovation. ● Apply appropriate academic and technical skills.
Social Studies
Standard 6.1 U.S. History: America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

NGSS ONLINE RESOURCES (K-5)

General Information:

1. "Lab Before Blab" - Conducting investigations before explanations. Other PBS education videos are also instructive. (http://www.thirteen.org/programs/pbs-newshour/lab-before-blab-lights-upelementary-school-science-1392155837/)

2. NJDOE model curricula: a framework of suggested topic sequences, course outlines, guiding questions, links to videos, etc. (http://www.state.nj.us/education/modelcurriculum/sci/)

3. The National Science Teachers Association website. For members and non-members, NGSS resources, conferences, webinars, books, free downloads, videos. (http://www.nsta.org/)

4. Free NGSS digital copies and ancillary materials, videos, curriculum ideas, embedded assessment unit plans. (www.nextgenscience.org)

5. NGSS Evidence Statements downloadable for every K-12 Performance Expectation. Also: videos and other free materials. (http://nextgenscience.org/evidence-statements)

6. Videos, lessons, NGSS information, and more. (http://www.teachingchannel.org/)

Instruction:

1. Brief summaries of STEM Teaching Tools that encapsulate the practices of NGSS reform. (http://stemteachingtools.org/tools)

2. PD strategies for NGSS. (http://www.cesa4.k12.wi.us/cms_files/resources/NGSS%20Professional%20Development%20Strategies.pdf.)

3. TERC provides online PD programs as part of their Inquiry Project for grades 3-5. The strategies for supporting productive science discourse in the classroom are applicable for higher grades as well. Online materials for the Talk Moves and Talk Science approaches are downloadable. (http://inquiryproject.terc.edu/)

4. Study Jams from Scholastic. Interactive science activities. (https://www.scholastic.com/teachers/activities/teaching-content/matter-9-studyjams-interactive-science-sctivities/

Assessment:

1. Developing assessments for the NGSS. It addresses K-12 including AP courses, explains the research on assessment providing examples, resources, unit outlines, rubrics, and examples of student responses. (http://www.nap.edu/catalog.php?record_id=18409)

2. NAEP interactive assessment tasks for elementary, middle, and high school, with scoring and analyses of student responses. (http://www.nationsreportcard.gov/science_2009/)

3. "Below you will find links to released test items for the New Jersey Student Learning Assessment-Science. Please know that the middle and high school assessments are said to be comprehensive, incorporating standards from physical, life, and earth/space sciences." (April 2018, Bergen County)
http://www.state.nj.us/education/aps/cccs/science/assessment.htm
https://nj.testnav.com/client/index.html#login?username=LGN))5710830&password=YTDEKPMW
http://ct.portal.airast.org/

4. "The URL below is being shared with you by Mike Heinz, Science Coordinator, NJDOE. The link contains the raw drafts of the science assessment tasks that counties have contributed to. **These are in DRAFT form**. They need to be reviewed, formatted, and field tested. This is a compilation of the assessment collaborations that were done since August 2017. When sharing with your teachers, please be sure to indicate that these are **draft tasks**; they have neither been reviewed nor vetted. Teachers **may** want to use them as formative assessment tasks that are **not graded**. Student performance will provide the teacher with some data about how well the task performs without impacting a student's grade. And of course, Mike would appreciate your feedback about the appropriateness and applicability of each task so that continuous improvements may be made." (March 2018, Bergen County) (https://tinyurl.com/draftstasksnj1)

Phenomena:

1. Finding phenomena for lessons, investigations, and/or units can be found at **https://thewonderofscience.com/phenomenal/**

2. Finding phenomena for lessons, investigations, and/or units can be found at **www.ngssphenomena.com**

CER: Claims – Evidence - Reasoning

1. Audi Commercial "Alien": Is the little girl's father an alien? Watch the video: make a claim, provide evidence, and offer reasons. (http://www.youtube.com/watch?v=89uJz_us4PM)

Authentic Data:

1. MY NASA DATA (MND)'s tools allow access real NASA Earth Science data. Through the use of MND's Live Access Server (LAS) data viewer, one can create a variety of charts, plots, and graphs to explore Earth systems and answer research questions. MY NASA DATA offers a large number of lesson plans, tools, and resources. (https://mynasadata.larc.nasa.gov/)
2. With NOAA's Data in the Classroom, students use real-time ocean data to explore today's environmental issues and develop problem-solving skills employed by scientists. Classroom-ready activities are available. (https://dataintheclassroom.noaa.gov/)
3. US Geological Survey (USGS) Real-time Data. USGS scientists gather information through periodic or continuous measurement in the field to provide a view of current conditions. (https://www.usgs.gov/products/data-and-tools/real-time-data)