4th Grade Mystery Science Strand 4.4 Observable Patterns in the Sky
Salt Lake City School District 2020-2021

Mystery Science Lesson Rationale:
Mystery Science Lessons seek to promote engagement and inspire excellence in students' mastery of science and engineering. The lessons support our vision and mission of equity and access in elementary science. The sequence of Mystery Science Full Lessons supports fourth grade students' sense making with respect to observable patterns in the sky using three- dimensional instruction. The sequenced Mystery Science Lessons support fourth grade teachers in implementing the new Utah SEEd Standards about Patterns in the sky identified specifically in the Prioritized SEEd Pacing Guide. Lessons include a video focused on a phenomenon, a hands-on activity, and an assessment. The lessons are designed to take students approximately 60 minutes to complete. Most lessons use minimal materials, such as printouts and pencils. Additionally, most paper printouts can be downloaded individually from the Mystery Science Lessons website in the form of an editable document that can be assigned through Canvas. Some lessons suggest markers, group work, or demonstrations. Teachers can make easy modifications to these lessons based on students and teachers' resources.

Note: Use a Science Notebook or print the Mystery Science PDF Booklet for students to complete the lesson series below.
You can also print individual lesson materials by following the links in the ***Materials per student and Assessments***.

Strand 4.4 Observable Patterns in the sky
The sun is a star that appears larger and brighter than other stars because it is closer to Earth. The rotation of Earth on its axis and orbit of Earth around the Sun causes observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the Sun and stars at different times of the day, month, and year.

Standard 4.4.1 Relative Distance
Construct an explanation that differences in the apparent brightness of the Sun compared to other stars is due to the relative distance (scale) of stars from Earth. Emphasize relative distance from Earth. (ESS1.A)

Mystery Science Lesson	Suggested Date and SEEd Alignment	Materials and Assessments	Remote Learning Modifications
Anchor Phenomenon Lesson: Star Trails The anchoring phenomenon for this unit is star trails that appear in long-exposure photographs. Students	**April 19** Before starting this lesson, review the **Teacher Guide** for a unit overview of the Anchor Layer. **Teachers note:** Make sure to turn on the Mystery Science anchoring phenomenon in the **Spaceship Earth Unit**	**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	**Ready to Teach** Make sure ALL students have copies of the handouts

generate observations and questions about the phenomenon and create an initial model to explain what causes these patterns to form.	This Unit is a Mystery Science 5th grade Unit and meets Utah SEEd Strand 4.4. **Mystery Science Handouts Pdf** SLCSD 20/21 Prioritized Pacing Guide **Note:** The district pacing guide suggests that this unit be taught April 19-May 7. All lessons in the unit are presented. Complete some or all lessons within your time frame.		
Lesson 1: How fast does the Earth Spin? In this lesson, students come to understand that the setting Sun isn't moving, the Earth is spinning. In the activity, Spinning Earth, students use their bodies as a kinesthetic model of the Earth to understand how the speed of the Earth's spin affects the length of a day.	**April 19** SEEd Standard 4.4.1 & 4.4.2 **Disciplinary Core Ideas**: 5-ESS1-2 Day, Night, & Earth's Rotation **Science and Engineering Practice:** Develop and use a model & Use mathematics and computational thinking **Crosscutting Concept:** Patterns, Cause & effect	**Materials per Student:** **Earth Map** printout **Sun Model** printout Crayons Scissors Sticker labels (1" x 3") **Newsela Articles:** How fast does the Earth Spin? **Assessment:** Mystery 1 Assessment Answer Key	**Ready to Teach** ***Teaching in the classroom*** ●No supply adjustments ●Have students do the activity solo ●To maintain safe distancing during the activity: Have students stand farther apart and use a lamp in the classroom instead of the Sun Model. You could also stand in the center of the room and pretend to be the Sun Model. ***Teaching Online*** Each student needs 4 stickers and the *Earth Map* (printed). Ask students to use a lamp at home instead of the Sun Model.
Anchor Phenomenon Lesson 1		**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	
Lesson 2: Who set the first clock? In this lesson, students will learn why our ancestors divided the day into hours and how clocks	**April 26** SEEd Standard 4.4.1 & 4.4.2 **Disciplinary Core Ideas**: 5-ESS1-2 Earth's Rotation & Daily Shadow Patterns	**Materials per Student:** **Shadow Clock Template** printout Use Google to find your latitude, then print your clock template. Blank paper (8.5 x 11) Glue sticks	**Adjust Supplies** ***Teaching in the classroom*** ● How to adjust supplies so students can work solo: Double the number of flashlights listed in the supply list below. ***Teaching Online***

measure the Sun's apparent movement. In the activity, make a Shadow Clock, students make their own sundials. First, students use flashlights indoors to understand how the position of the light affects the time shown on the clock. Then, students take their shadow clocks outside to see how the position of the Sun can tell them the time of day.	**Science and Engineering Practice:** Planning and carrying out an investigation & Interpret data **Crosscutting Concept:** Patterns	Rulers Scissors Paper plates Toothpicks White chalk Bright flashlights Sticky tack **Newsela Articles:** Who set the first clock? **Assessment:** Mystery 2 assessment Answer Key	● Each student needs 1 paper plate, 1 toothpick, 1 bit of sticky tack and the *Shadow Clock* (printed). Students will need to use a flashlight or lamp at home to model the Sun.
Anchor Phenomenon Lesson 2		**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	
Lesson 3: How can the Sun tell you the season? In this lesson, students discover how the Sun's path changes with the seasons. In the visual activity, Guess the Season, students figure out the season of the year by studying a photo. Students come to realize that they can use the time of day and length of shadows to figure out the season in each photo.	**May 3** SEEd Standard 4.4.1 & 4.4.2 **Disciplinary Core Ideas**: 5-ESS1-2 Seasonal Changes & Shadow Length **Science and Engineering Practice:** Engaging in argument from evidence & analyze and interpret data **Crosscutting Concept:** Patterns, Cause & effect	**Materials per student:** *No supplies needed **Newsela Articles:** How can the Sun tell you the season? **Assessment:** Mystery 3 assessment Answer Key	**Ready to Teach** ● Have students do the activity solo. ● No supply adjustments.
Anchor Phenomenon Lesson 3		**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	
Lesson 4: Why do the stars change	**May 10** SEEd Standard 4.4.1 & 4.4.2	**Materials per student:** **Constellation Guide & Universe-in-a-Box**	**Ready to Teach** Each student needs 1 paper fastener, the *Constellation*

with the seasons? In this lesson, students will be introduced to the Earth's orbital movement around the Sun, as a means of seeing why the constellations change. In the activity, Universe-in-a-Box, students make a paper model that helps them visualize the Earth's yearly orbit around the Sun. They use this model to understand why some constellations are only visible during part of the year.	**Disciplinary Core Ideas**: 5-ESS1-2 Seasonal Patterns & Earth's Orbit **Science and Engineering Practice:** Develop a model **Crosscutting Concept:** Patterns	**(Northern Hemisphere)** printout Alternatively, you can print our **Southern Hemisphere** version. **Universe-in-a-Box Answer Key** teacher-only resource **Universe-in-a-Box Teacher Tips** worksheet Rulers Scissors Paper fasteners **Newsela Articles:** How can the Sun tell you the season? **Assessment:** Mystery 4 assessment Answer Key	*Guide & Universe-In-A-Box* (printed).
Anchor Phenomenon Lesson 4		**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	
Lesson 5: Why does the moon change shape? This lesson explores why the Moon seems to change shape (phases) over the course of a month. In the activity, Model the Moon's Phases, students use a Styrofoam ball as a model of the Moon and a flashlight as a	**May 17** SEEd Standard 4.4.1 & 4.4.2 **Disciplinary Core Ideas**: 5-ESS1-2 Moon Phases, Lunar Cycle **Science and Engineering Practice:** Planning and carrying out an investigation **Crosscutting Concept:** Patterns & Cause and effect	**Materials per student:** Pencil Bright Flashlights Styrofoam balls **Newsela Articles:** Why does the moon change shape? **Assessment:** Mystery 5 assessment Answer Key	**Adjust Supplies** ***Teaching in the classroom*** ● Adjust these supply quantities so students can work solo: You'll need 1 Styrofoam ball per student. Instead of having students work in pairs with flashlights, they can work solo and use a bright lamp as the light source. ●**This video** illustrates how to run the activity using a bright lamp. ***Teaching Online*** ●Each student needs a 2" Styrofoam ball (or have them use another round object at home, like a ball or an orange).

model of the Sun to gain a better understanding of how the interactions between the Sun and Moon are responsible for the Moon's phases.			We suggest that students use a bright lamp instead of a flashlight as the light source (if possible). ● **This video** illustrates how to run the activity using a bright lamp.
Anchor Phenomenon Lesson 5		**Materials per student:** **See-Think-Wonder** chart **Night-Sky Patterns** worksheet	
Lesson 6: What are the wandering stars? This lesson introduces the "wandering stars." Students will learn what it means to see them with their own eyes and will learn some interesting discoveries about each one. In the activity, running to Neptune, students draw out the planets in our Solar System with chalk on the playground. Then, they play a racing game, running to each planet, reinforcing the names, order, and relative distances between the planets.	**May 24** SEEd Standard 4.4.1 & 4.4.2 **Disciplinary Core Ideas**: 5-ESS1-2 Planets & Solar System **Science and Engineering Practice:** Develop and use a model **Crosscutting Concept:** Systems and system models	**Materials per student:** **Distance Between Planets** worksheet Permanent marker Rulers Scissors Toilet paper tube Colored chalk string **Newsela Articles:** What are the wandering stars? **Assessment:** Mystery 6 assessment Answer Key	**Substitute Activity** ***Teaching in the classroom*** ● Have your students watch this **7-minute video** about building a scale model of the Solar System. Consider having students use chalk to create a **scale model of the Solar System** in their neighborhood. ***Teaching Online*** ● Have your students watch this **7-minute video** about building a scale model of the Solar System. Consider having students use chalk to create a **scale model of the Solar System** in their neighborhood.

Anchor Phenomenon Lesson 6		**Materials per student:** See-Think-Wonder chart Night-Sky Patterns worksheet	
Lesson 8: (Skip lesson 7) Could there be life on other planets? In this lesson, students discover that the Earth is in the "Goldilocks Zone" — a distance from the Sun with the right amount of light and heat for life to exist. In the activity, Star Explorer, students plan a space mission to another planet outside our Solar System based on the amount of heat and light that reaches the planet's surface. Once students plan their space mission, they will reflect on what our Sun would look like from this far-away planet.	**May 31** SEEd Standard 4.4.1 **Disciplinary Core Ideas**: 5-ESS1-1 Star Brightness & Habitable Planets **Science and Engineering Practice:** Engaging in argument from evidence **Crosscutting Concept:** Systems & Scale, proportion, and quantity	**Materials per student:** Gravity Guru & Spinning Specialist worksheet Mission Plan worksheet Plant Pro worksheet Plant Pro, Water Wizard, and Mission Plan Answer Keys teacher-only resource Starlight Guide worksheet Starlight Guide Answer Key teacher-only resource Water Wizard worksheet scissors **Newsela Articles:** Could there be life on other planets? **Assessment:** Mystery 8 Assessment Answer Key	**Adjust Supplies** ***Teaching in the classroom*** ● Adjust these supply quantities so students can work solo: Print 2x as many worksheets as listed below. This activity works best if students can have discussions (at a safe distance). ***Teaching Online*** ● Each student needs a copy of each printout (printed or digital). This activity works best if students can engage in a virtual discussion.
Anchor Phenomenon Lesson 8		**Materials per student:** See-Think-Wonder chart Night-Sky Patterns worksheet	
Performance Task: How can you tell time at night? In the Performance Task, students use engineering design principles to invent a clock that uses patterns in the night sky. They evaluate possible patterns, suggest multiple ways to measure time with	**May 31** SEEd Standard 4.4.1 **Disciplinary Core Ideas**: 5-ESS1-1 Star Brightness & Habitable Planets **Science and Engineering Practice:** Engaging in argument from evidence **Crosscutting Concept:** Systems & Scale, proportion, and quantity	**Materials per student:** Print one Time-Keeper Challenge for each person. The Time-Keeper Challenge Answer Key **Assessment:** Unit Assessment Answer Key	**Ready to Teach** ***Teaching Online*** Send Supplies home with students to complete the activity.

those patterns, and describe their final design and how it works.			