Anoka Hennepin K-12 Curriculum Unit Plan

Department: Science	**Grade Level: 3rd**
Unit Title: Sun, Moon, and Stars	**Trimester: Trimester 1: 12 one-hour days, or 24 half-hour days**

Unit Summary: The main purpose of this inquiry-based unit is for students to observe, collect data and describe the patterns of the sun and moon and explain how they affect our daily lives. Students will use key science vocabulary, measurement strategies and the engineering design process to learn about the relationships between shadows and light. Properties of light will be introduced in this unit and continued in the Sound and Light unit. Students will observe the moon in the night sky and record the changes in order to understand that the moon moves in a regular and predictable pattern. Students will explore constellations, how people have observed them in various seasons, and explain why they appear to move across the night sky. The GRASPSS and other summative assessments require students to show understanding of patterns in the sky.

Field Trip Ideas and Other Resources: There are numerous benefits to scheduling a field trip or shared experience at the beginning of the unit or towards the end. At the beginning you build a common experience for your students to set a base for everyone before beginning the unit. Scheduling towards the end can be beneficial for students to solidify concepts learned throughout the unit. Some field trip ideas include:

Observatory and Star Lab – Website: http://www.anoka.k12.mn.us/domain/101 Email: Schmit, Ronald <Ronald.Schmit@anoka.k12.mn.us>

(Website is for the Jackson Middle School Observatory, for information on the StarLab, contact Ron Schmit)

Como Planetarium – Website: http://planetarium.spps.org/ Phone Number: (651) 293-5398 Email: como.planetarium@spps.org

Exploradome – Website: http://www.bellmuseum.umn.edu/ExploraDome/index.htm General Info: 952-847-8210

Scheduling: http://www.bellmuseum.umn.edu/ExploraDome/OntheRoad/SchedulingaVisit/index.htm

*The Exploradome is located at the Bell Museum at the U of M campus, but can also be hired to come out to a building. Look for free admission days, normally on Sundays, and special events to share with families.

Program Understandings or Big Ideas:

Program Understanding and/or Minnesota State/Local/Core Standards and Technology Standard(s) addressed:

I. Students will understand that earth and space are composed of different systems and cycles that influence their daily lives.

V. Students will understand that the process of inquiry is the collection of information verified through observation and experimentation which allow scientists to critically analyze, draw conclusions and make inferences about the natural world.

VI. Students will understand that scientists use various communications to share knowledge and promote understanding about out natural world.

VIII. Students will understand that scientists use and design technology to answer questions, share information and solve problems.

IX. Students will understand that science reflects its history and is an ongoing, changing enterprise that often leads to looking at old observations in new ways.

Link to ⇒ | Stage 1 | Stage 2 | Stage 3

Stage 1: Desired Results

Established Goals/Standards	Acquisition ⇔ Meaning Making ⇔ Transfer

MN Academic Standards and Benchmarks in Science:

3.1.1.1 Scientists work as individuals and in groups, emphasizing evidence, open communication and skepticism.

- 3.1.1.1.1 Provide evidence to support claims other than saying "Everyone knows that," or "I just know," and question such reasons when given by others.

3.1.1.2 Scientific inquiry is a set of interrelated processes incorporating multiple approaches that are used to pose questions about the natural world and investigate phenomena.

- 3.1.1.2.1 Generate questions that can be answered when scientific knowledge is combined with knowledge gained from one's

Transfer

Students will be able to independently use their learning to…

- identify patterns of objects we see in the sky.

Meaning Making

UNDERSTANDINGS	ESSENTIAL QUESTIONS
Student will understand that… *What specifically do you want students to understand? For 40 years (overarching from course framework), 4 years (about unit topic). What inferences should they make?* **Overarching (Framework)**	***Students will keep considering:*** *For 40 years (overarching from course framework), 4 years (about unit topic). What thought-provoking questions will foster inquiry, meaning-making and transfer?* **Overarching (Framework)**

own observations or investigations. ○ 3.1.1.2.2 Recognize that when a science investigation is done the way it was done before, even in a different place, a similar result is expected. For example: Investigate the sounds produced by striking various objects. *(This benchmark is also addressed in "Sound and Light")* ○ 3.1.1.2.3 Maintain a record of observations, procedures and explanations, being careful to distinguish between actual observations and ideas about what was observed. For example: Make a chart comparing observations about the structures of plants and animals. *(This benchmark is also addressed in "Sound and Light")* ○ 3.1.1.2.4 Construct reasonable explanations based on evidence collected from observations or experiments. 3.1.3.2 Men and women throughout the history of all cultures, including Minnesota American Indian tribes and communities, have been involved in engineering design and scientific inquiry. ○ 3.1.3.2.1 Understand that everybody can use evidence to learn about the natural world, identify patterns in	• Most objects in the solar system move in a regular and predictable motion and help explain what we see in the sky • Energy appears in different forms, including sound and light, which have unique properties/characteristics • Scientific investigations require us to ask questions, make observations, plan and create tests to verify predictions with evidence and data, and generate further questions • Scientists use a variety of written and oral communication skills to supports and discuss their findings • Scientists work individually and collaboratively to understand the natural world and learn from one another • Engineers and scientists design and apply technology either as a product or a process to accomplish a task • Men and women throughout the history of all cultures, including Minnesota American Indian tribes and communities, have been involved in engineering design and scientific inquiry **Topical (Unit)** • Changes in the patterns of the sun and moon are predictable and affect our daily lives • Light sources, at varying distances, may appear different in size	• Why do the sun and moon appear to move and change? • Why do some objects in space look larger than others? • How do I use observations to construct reasonable explanations? • How do scientists share what they know with others? • How have men and women throughout history of all cultures been involved in engineering design and scientific inquiry? **Topical (Unit)** • How does the earth, sun and the moon affect our lives? • Why do stars appear to travel across the sky at night and appear to be different sizes? • What do you notice about the patterns of the sun, moon and stars?

nature, and develop tools. For example: Ojibwe and Dakota knowledge and use of patterns in the stars to predict and plan.

- 3.1.3.2.2 Recognize that the practice of science and/or engineering involves many different kinds of work and engages men and women of all ages and backgrounds.

3.2.3.1 Energy appears in different forms, including sound and light.

- 3.2.3.1.1 Explain the relationship between the pitch of a sound, the rate of vibration of the source and factors that affect pitch. For example: Changing the length of a string that is plucked changes the pitch.*(This benchmark is also addressed in "Sound and Light")*
- 3.2.3.1.2 Explain how shadows form and can change in various ways.
- 3.2.3.1.3 Describe how light travels in a straight line until it is absorbed, redirected, reflected or allowed to pass through an object. For example: Use a

• Light and sound are forms of energy and travel in different ways • Scientists observe the world around them, ask questions and plan investigations to gather evidence to support claims and generate further questions • The practice of science and/or engineering involves many different kinds of tools and technology • Men and women throughout the history of all cultures have been involved in the study of the sun, moon and stars	• How are shadows and light related? • What do I do with my scientific questions? • How have people from various cultures used knowledge of sun, moon, and stars in their lives?

Acquisition

Students will know… *What facts and basic concepts should students know and be able to recall?*	***Students will be skilled at…*** *What discrete skills and processes should students be able to use?*
• Light is energy. • Light travels in a straight line until interrupted. • Day happens when a location on Earth is facing toward the sun; night happens when a location on Earth is facing away from the sun. • Sun appears to rise in the east and set in the west everyday due to the earth's rotation • The four cardinal directions (east, west, north, south)	• Record, observe, and explain the different paths light can take (absorbed, reflected, refracted, redirected) • Use a compass to determine directions (east, west, north, south) • Observe and record the path the sun takes in the sky. • Observe and collect shadow data at different times of day.

flashlight, mirrors and water to demonstrate reflection and bending of light.*(This benchmark is also addressed in "Sound and Light")*

3.3.3.1 The sun and moon have locations and movements that can be observed and described.

- 3.3.3.1.1 Observe and describe the daily and seasonal changes in the position of the sun and compare observations.
- 3.3.3.1.2 Recognize the pattern of apparent changes in the moon's shape and position.

3.3.3.2 Objects in the solar system are seen from Earth as points of light with distinctive patterns of motion.

- 3.3.3.2.1 Demonstrate how a large light source at a great distance looks like a small light that is much closer. For example: Car headlights at a distance look small compared to when they are close.
- 3.3.3.2.2 Recognize that the Earth is one of several planets that orbit the sun,

• Shadows are the areas of darkness created when an object blocks light. • The shapes of shadows change over a day and depend on the position of the sun in the sky. • The sun's location in the sky varies by season. • The moon, stars and other planets are always present, but more visible in the night sky • The earth rotates • Earth orbits the sun. • The moon orbits Earth. • The moon can appear in the sky during both night and day. • The moon changes its appearance, or phase in a regular 4- week pattern. • Stars are suns positioned at great distances from Earth.	• Analyze shadow data to develop an explanation about the sun's daily movements. • Use shadow data to predict the position of the sun in the sky. • Use models to develop explanations. • Communicate observations and patterns of the sun and moon. • Observe and record changes in the moon's appearance over a month. • Analyze observations to discover the sequence of changes that occur during the moon's phase cycle.

Essential Vocabulary:** Vocabulary Resources with visuals here **and located on the curriculum website.

MCA Essential Vocabulary

- **Orbit** – to move or travel around an object in a curved path. Earth orbits Sun, Moon orbits Earth
- **Seasonal** –having to do with the seasons or a particular season of the year; spring, summer, fall or winter
- **Rotation** – when an object spins completely around on its axis
- **Revolution** – motion in orbit around a point, like the moon moving around Earth.
- **Universe** – outer space and everything in it; includes all the planets, moons, asteroids, space, dust, comets, gas clouds and vast areas of empty space
- **Solar System** – the sun, the planets, and other objects that orbit the sun

Sun, Moon & Stars Essential Vocabulary

- Cardinal Directions – the four main directions- north, south, east and west
- Sun – the star that Earth and other planets orbit
- Compass – a tool that points to the north and shows south, east, and west

and that the moon orbits the Earth.	• Day – the time between sunrise and sunset on Earth when it is light OR 24 hour period of time in an entire day. • Night – the time between sunset and sunrise on Earth when it is dark • Shadow – the dark area behind an object that blocks light • Moon – a large object that orbits a planet, like the Moon orbits Earth. • Star – a huge ball of gas that gives off heat and light. The Sun is a star. • Constellation – a group of stars humans give a name • Telescope – a tool that makes faraway objects appear closer and larger • Astronomer – a scientist who studies objects in the universe including the stars, planets, and moons **Everyday Science Vocabulary** (Used in all units) • **Inquiry** – a process of asking questions to seek information • **Investigation** - observe or study by close examination • **Procedures** – a series of steps that must be taken in order to do something • **Evidence** – something that gives proof or a reason to believe • **Investigable Question**- a question or idea that can be tested and measured; how does X affect Y, or how does A compare to B (This term should also be referred to as a testable or experimental question because this concept is presented using various terms on the MCA.) • **Reasonable-** using clear sense or clear thinking • **Comparisons**- to look at two or more things to determine similarities and differences • **Prediction**- a thought about what might happen, using what you know Common misunderstanding(s): *Note: Teacher may want to review the "Background for the Teacher" section of the FOSS TLG pg. 108-113 to help with content background that could address misunderstandings.* • The sun moves. • Stars are small. • The moon gives off light. • All lights in the sky are stars. • All planets orbit in a circle around the sun. • The sun orbits the Earth. • The sun is not a star. • Light can change direction all by itself. • Shadows follow you.