

Virtual Tracers

Primary Curriculum	Grade 1
Supplemental Curriculum	Grades 1–3
Notes	Standard unit/refill kit comes with enough materials for 30 students.

Description

What does it take to see in the dark?

Humans need light to see what is around them. Sometimes it is easy to identify the source of that light—the sun, the moon, an overhead light bulb—while other times it can be a bit confusing. How can we see a glow-in-the-dark picture? How do night vision goggles work? And how do augmented and virtual reality technology use light to have us see things that aren't even there?

Using the overarching phenomenon of night vision and the theme of secret missions, students will explore different sources of light and illumination as they ask themselves: *“What would I do to be seen and what would I do to stay hidden?”*

Main Investigations

Direction of Light



Do You See What I See?



Planning Your Secret Mission

When Should You Travel?

Date	Sun Rise	Sun Set	Hours of Light	Day Sky	Night Sky
January 7, 2019	7:56 AM	4:34 PM	8:38	Sun Clouds	No moon, stars
January 21, 2019	7:48 AM	4:53 PM	9:05	Sun Clouds	Full moon
February 7, 2019	7:27 AM	5:19 PM	9:52	Sun	No moon, stars
February 21, 2019	7:09 AM	5:41 PM	10:37	Sun	Almost full moon, stars
March 7, 2019	6:38 AM	6:03 PM	11:24	Fog, clouds	No moon, no stars

Number of Lessons*

Full unit – 25 lessons

Supplemental program – minimum 8–10 lessons

**Lesson = 30–40 min. block, 50% of full unit lessons can be delivered in non-science classes*

Best Suited For

- Classroom science instruction

Overarching Enduring Understanding

How many different ways can we “see”?

Number of Lessons*

Full unit – 25 lessons

Supplemental program – minimum 8-10 lessons

*Lesson = 30 – 40 min block, 50% of full unit lessons can be delivered in non-science classes

Flow of Instruction

Summative Challenge: Secret Mission (Summative Challenge, occurs during weeks 6–8)

*This summative challenge is the driving force behind the activities and lessons in this unit—the reason **why** students are working through the smaller investigations. With that in mind, we think it’s best to introduce the summative challenge at the beginning, even though students won’t technically be working on it until the end of the unit.*

Students will pick from a variety of a secret mission storylines (a number are provided but teachers can adjust if desired) and create a story. As part of their story they must provide strategies for the following questions and justify their strategy based on information and data collected during the unit investigations:

- When should the spy travel (time of day, time of year) to avoid being seen?
- How can they communicate with their spy partner who is nearby?
- How can they get a message back to mission control?

Introductory Investigation: The Direction of Light

For this introductory investigation have students examine what happens with the light when they look through the polarizing films. In some cases, they will only need once piece of film to block out a lot of the light. This is because for those objects (some phones, projectors, and laptop screens) the light coming off them has already passed through a built-in polarizer.

Investigation: Do You See What I See? (hands-on investigation, occurs during weeks 2–4)

Part A:

Using both regular paint and UV sensitive paint students are asked to create different designs. In small groups students are asked to look at the designs in a dark room and describe what they see. Afterwards students reflect on the differences in their observations and discuss how they might be able use this information for their secret mission.

Part B:

In small groups students are given a variety of objects (some reflective others not) and tasked with determining how to get a *communicate* a message (an image) around a corner. The follow up discussion includes a reflection on mirrors and how these observations might be used in their secret mission project.

Investigation: When Should You Travel? (Research project, occurs during weeks 2–6)

In order to answer the question “When should the spy travel” the class will collect data (both from direct observation and from group research) to determine the following pieces of information for the year:

- What time does the sun rise?
- What time did the sun set?
- How many hours of daylight was there?
- What do you see in the daytime sky?
- What do you see in the nighttime sky?

The class should collect at least 4 weeks of daily/every-other-day data and then discuss:

- The patterns they see
- Their expectation for the other 11 months of the year
- How this related to their secret mission project.

Parts List

Full Unit

Printed Materials

- Educator Guide
- Individual My STEM Explorer Notes™ notebooks
- Timeline sheets
- Introductory investigation sheets

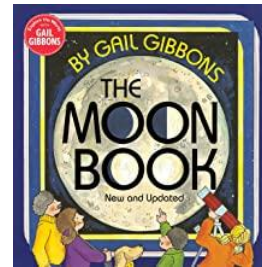
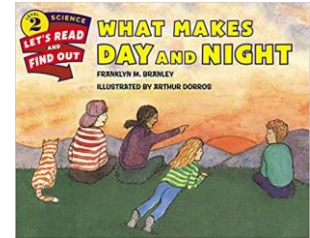
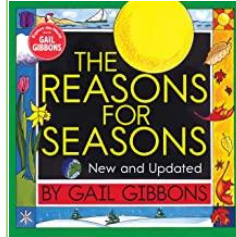
Provided Equipment & Materials

- Polarizing film (30 pieces)
- Regular Paint (6 sets)
- Glow-in-the-dark paint
- Paint Brushes (30)
- Heavy Paper (100 sheets)
- 15 “Reflection” sets (contains mirror cardstock, 3-in plastic disc, mini pie tins, cork pieces)
- UV Flashlights (6)

Common Equipment & Materials Needed but NOT Provided

- NA

Trade Books



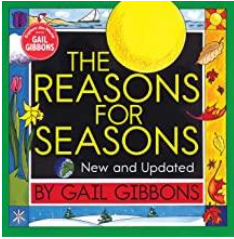
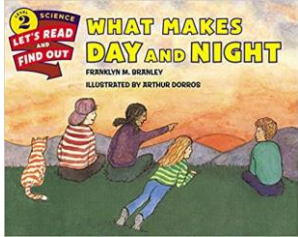
- *The Reasons for the Seasons*
- *What Makes Day and Night*
- *The Moon Book*

Digital Resources

- Electronic copies of printed materials
- How-To videos for investigations
- Easy-to-use links to publicly available videos and other information.

¹Included in refill kit

Supplemental Unit

<p>Printed Materials</p> <ul style="list-style-type: none"> • Educator Guide • Individual My <i>STEM Explorer Notes™</i> notebooks • Timeline sheets • Introductory investigation sheets 	<p>Trade Books</p> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;">  </div> <ul style="list-style-type: none"> • <i>The Reasons for the Seasons</i> • <i>What Makes Day and Night</i> • <i>The Moon Book</i>
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<p>Common Equipment & Materials Needed but NOT Provided</p> <ul style="list-style-type: none"> • NA 	

Refill Kit

<p>Printed Materials</p> <ul style="list-style-type: none"> • Educator Guide • Individual My <i>STEM Explorer Notes™</i> notebooks • Timeline sheets • Introductory investigation sheets
<p>Provided Equipment & Materials</p> <ul style="list-style-type: none"> • Regular Paint (6 sets) • Glow-in-the-dark paint • Heavy Paper (100 sheets)
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Overarching Enduring Understanding
How many different ways can we “see”?

1-PS4-2

Make observations to construct an evidence-based account that objects can be seen only when illuminated.

1-PS4-3

Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.

1-PS4-4

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

1-ESS1-1

Use observations of the sun, moon, and stars to describe patterns that can be predicted.

1-ESS1-2

Make observations at different times of year to relate the amount of daylight to the time of year.

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- When should the spy travel (time of day, time of year) to avoid being seen? (1-ESS1-1,2)
- How can they communicate with their spy partner who is nearby? (1-PS4-3)
- How can they get a message back to mission control? (1-PS4-4)

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Part B:

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