

Physical Sciences

Light from a source

Year 5 Unit of Inquiry

Planeteers Game-based Learning Platform

Science and Technology, Arts, Math and Engineering

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Outcomes and Content

Science & Technology

Curriculum Content Code: ACSSU080

Learning Outcomes

Recognises that light from a source forms shadows and can be absorbed, reflected and refracted; Explains how useful light sources are to humans and infer how light travels in straight lines

Standards: Light Source

1. Why is light important in order to see objects in the dark?
 2. How can lights help in keeping the a community or a farmland safe?
 3. What happens when light sources shine on different objects?
 4. How are shadows casted?
- Recognise that the colour of an object depends on the properties of the object and the colour of the light source
 - Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
 - Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
 - Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

Engineering

STEAM Curriculum Code: ED1.1 | ED1.2 | EN1.1 | EN1.2

Learning Outcomes

Selects appropriate materials to meet a design need; Identifies and creates simple or complex machines

Standards: Design Process for Innovation

1. How will you design or create a watch tower/light house for the safety of the farmlands and crops?
- Identify and use appropriate materials in creating a watch tower
 - Build products that use appropriate elements and parts

Arts & Mathematics

Learning Outcomes

Construct 3-D simple and complex vehicles using geometric shapes/blocks, polygons, space, and repetition of colors to show the balance of the structure and shape

Standards: Elements of Design and Geometry

1. What shapes and materials should be used to create a watch tower/light house for farmland and crops' safety?
- Describe the attributes/properties of triangles and quadrilaterals using concrete objects or models
 - Demonstrate understanding of the concepts of parallel and perpendicular lines, angles, triangles, and quadrilaterals
 - Identify and describe triangles according to sides and angles
 - Identify and describe the different kinds of quadrilaterals: square, rectangle, parallelogram, trapezoid, and rhombus

Social Studies

Learning Outcomes

Examines projects and activities by the government for the common good in the community

Standards: Government and its services

1. How do watch towers/light house benefit the safety of the farmlands and the community in general?
- Describe and analyze the impact of a watchtower/light houses on safety of protected areas i.e. larger farmlands

Unit Summary

Grade:

5

Subject:

Science, Technology,
English, Arts and Math

Duration:

1 week (50 minutes/day)

Syllabus Mapping:

- Light Sources
- Geometry
- Elements and Principles of Design
- Design Process for Innovation
- Making

Integration:

- Science
- Mathematics
- Arts
- Engineering
- Technology

Outcomes:

ACSSU080

Inquiry and Focus Questions:**Driving Question:**

Managing a large farm and protecting the crops and animals from thieves and other animals can really be difficult especially during nighttime. How can you build or create a watch tower/light house to protect and watch over your farmland?

Science & Technology Inquires:

- Why is light important in order to see objects in the dark?
- How can lights help in keeping the a community or a farmland safe?
- What happens when light sources shine on different objects?
- How are shadows casted?

Mathematics, Arts and Engineering Inquiries:

- How will you design or create a watch tower/light house for the safety of the farmlands and crops?
- What shapes and materials should be used to create a watch tower/light house for farmland and crops' safety?

Social Studies Inquiries:

- How do watch towers/light house benefit the safety of the farmlands and the community in general?

Learning across the Curriculum:**Cross-curriculum priority**

- Sustainability

General Capabilities

- Teamwork & Collaboration
- Critical & Creative Thinking
- ICT Capability
- Numeracy
- Literacy
- Environmental Awareness

Skills Focus:**Working Scientifically**

- Communicating
- Questioning and predicting

Design and Production

- Researching and planning
- Design and innovation
- Producing, implementing, testing, refining

Skills Focus:

This unit of investigation explores concepts from the core science standards for light sources, with a focus on investigating light and how we see things. Students use an individual inquiry-based approach to explore solutions to a multi-layered real-world question. They experiment with a number of in-game tasks to design and build a watch tower/light house in order to protect a farmland and the community. They test and refine the effectiveness of their design and construction, while minimizing the environmental and financial cost. Students learn about sustainable practices in protecting a farmland. They take action to improve their own and their community's social and environmental wellness.

Teaching, Learning & Assessment Activities

NOTE: 'Quest Game Activity' describes activities that happen in-game while 'Unplugged' occur outside the game

Lesson 1: Project Orientation and Research

Summary: Teacher discusses about light sources and the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light/bounces light into the eye. We see things because light travels from light sources to our eyes, or from light sources to objects and then to our eyes. As part of the project-based lesson, the teacher poses a challenge on the threat of loosing crops and farm animals from thieves and predators especially at during the night. Students are tasked with researching how human eye can only see objects at night when there is light and also as an optional research why most predators have the ability to see objects at night compared to humans. As part of the research, students learn about ways to protect farmlands and farm animals, such as designing and creating an a watch tower to illuminate and help observe the surrounding area.

Assessment: Pre-test about light sources (10 minutes)

Unplugged Activity: *Driving Question (15 minutes) – Brainstorm (Guided)*

Begins with a discussion about light sources and how it helps humans to see in the dark.

Teacher says, *"Light sources are very important to humans because it helps us see in the dark. Light travels in straight lines to explain that objects are seen because they give out or reflect light/bounces light into the eye and that we see things because light travels from light sources to our eyes, or from light sources to objects and then to our eyes. At night time, there's a threat of loosing crops and farm animals from thieves and predators. Most predators have the ability to see objects at night compared to humans."*

Teacher poses driving questions for the students to investigate and discover possible solutions:

Driving Q. *Managing a large farm and protecting the crops and animals from thieves and other animals can really be difficult especially during nighttime. How can you build or create a watch tower/light house to protect and watch over your farmland?*

Science & Technology Inquiries:

- Why is light important in order to see objects in the dark?
- How can lights help in keeping the a community or a farmland safe?
- What happens when light sources shine on different objects?
- How are shadows casted?

Social Studies Inquiries:

- How do watch towers/light house benefit the safety of the farmlands and the community in general?

Mathematics, Arts and Engineering Inquiries:

- How will you design or create a watch tower/light house for the safety of the farmlands and crops?
 - What shapes and materials should be used to create a watch tower/light house for farmland and crops' safety?
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Lesson 1: Project Orientation and Research (Continued)

Project Orientation (5 minutes)

- Teacher introduces the project and relates it to the discussion outcomes
- Teacher divides the class in research groups (recommend 4-6)
- Provides project guide and overview of the timeline of activities and assessments to students (organized by lesson)

Research and Design Journal (20 minutes)

- Students research, watch documentary videos, and read infographics about light sources and how watch towers/light houses can help in safety and security of protected areas.

Science & Technology Inquiries:

- Why is light important in order to see objects in the dark?
- How can lights help in keeping the a community or a farmland safe?
- What happens when light sources shine on different objects?
- How are shadows casted?

Social Studies Inquiries:

- How do watch towers/light house benefit the safety of the farmlands and the community in general?

Mathematics, Arts and Engineering Inquiries:

- How will you design or create a watch tower/light house for the safety of the farmlands and crops?
- What shapes and materials should be used to create a watch tower/light house for farmland and crops' safety?

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- Students brainstorm, draft their design and plans on a sheet of paper or project journal.**

** If teachers run out of time in the lesson to meaningfully allocate time for this exercise, students can be given the design plan during extra time.

Lesson 1 Assessment Ideas

Teachers should consider different assessment options throughout the project phases, including for example:

1. Quiz about light sources
2. Quality of student research and project journal
3. Design assessment and reasoning, problem solving
4. Group skills, time management, collaboration
5. Project works (later lessons)
6. Photo Essay (later lessons)

Lesson 2: Prototyping a Watch Tower

Introduction to the Lesson

Teacher guides the students in identifying basic parts of a watch tower/light house. Based on their design plan from lesson 1, students can start prototyping within the game. They should be able to explain the parts and how they promote safety and security for farmlands. They should also describe the materials used in their watch tower based on functions and scientific explanations. i.e. how does the light from the tower help humans see?

Teacher-Led Unplugged Activity (10 minutes)

- Teacher gives an overview of lesson goals, and reiterates the driving question.
- Teacher gives students the opportunity to ask questions before beginning their prototype.

Guided Game Quest Activity (30 minutes)

In-Game Prototype:

1. Use the Builder Tool to make an inventory of blocks and basic parts in building a watch tower/light house.
2. Use the Builder tool to create watch tower/light house that can help protect and watch over your farmland.
 - Ideally, the tower should include essential parts: Beam lights/lamps, sound alert button and a good foundation.
 - Students should consider changing the properties of the blocks (i.e. rocks, metal, etc.) in order to strengthen the foundation of their tower.
 - Ideally, the watch tower/light house should also include solar panels for sustainable energy.

Documentation using Game Camera:

- Using the Camera, students should take pictures of their prototype at different stages of construction.
- Later, in lesson 5, the photos will be used in their reflection and presentation i.e. they will create a photo essay and present their project in class.

Lesson 2 Assessment Ideas

Teachers should consider different assessment options throughout the project phases, including for example:

1. Quality of student research and project journal
2. Design assessment and reasoning, including material uses and reasoning in relation to light sources and how humans see things
3. Engineering approach, including aspect, size, parts that are environmentally-friendly, and other considerations that students should explain
4. Time management, collaboration, problem-solving skills

Lesson 3: Testing and Refining

Introduction to the Lesson

Students test and refine their watch tower/light house by discovering different textures in the Builder tool, trying out other useful parts to affect motion (rotating light beams), adjusting the size and height of their tower. With consideration of a farmland area, their watch tower should have enough lights beams that can illuminate the area.

Teacher-Led Unplugged Activity (10 minutes)

- Teacher gives an overview of lesson goals, and reiterates the driving question.
- Teacher gives students the opportunity to ask questions before they begin testing and refining their prototype.

Guided Game Quest Activity (30 minutes)

Refining and Testing the Prototype:

1. Using the game's Builder Tool, the students spend time in finishing their watch tower/light house.
2. When their basic prototype is completed, students should test their watch tower and see how it illuminates the area and the shows it casts when aimed to an object.
3. After their initial testing, they can refine their design based on initial observations and opportunities for improvement.
4. Students should explain their reasoning behind refining the design in their project journal.

Documentation using Game Camera

- Students should take pictures of their prototype at different stages of construction.
- They should take photos to illustrate how they refined their designs.
- Later, in lesson 5, the photos will be used in their reflection and assessment i.e. they will create a photo essay about their project.

Lesson 3 Assessment Ideas

Teachers should consider different assessment options throughout the project phases, including for example:

1. Quality of student research and project journal
2. Design assessment and reasoning, including material uses and reasoning in relation to light sources and how human see things
3. Engineering approach, including aspect, size, parts that are environmentally-friendly, and other considerations that students should explain
4. Time management, collaboration, problem-solving skills
5. And specifically for Lesson 3:
 - Design changes to improve functionality based on students' observation
 - Their reasoning and explanation for making these changes

Lesson 4: Project Finalization

Introduction to the Lesson

Teacher explains the importance of light sources to humans, how it helps in our security during nighttime and as well as surviving during the night.

Teacher-Led Unplugged Activity (10 minutes)

- Teacher gives an overview of lesson goals, and reiterates the driving question.
- Teacher gives students the opportunity to ask questions before using game to finalize their design/project.

Game Sandbox Activity (30 minutes)

Final Project

1. Use the Builder tool to make any final improvements to the watch tower: properties of blocks, size, length, basic and additional parts.
2. Students should finalize any and all additional design strategies for their watch tower for farmland safety and security.

Documentation using Game Camera

- Students should take photos to illustrate and record their final designs.
- Later, in lesson 5, the photos will be used in their reflection and assessment i.e. they will create a photo essay about their project.

Lesson 4 Assessment Ideas

Teachers should consider different assessment options throughout the project phases, including for example:

1. Quality of student research and project journal
2. Design assessment and reasoning, including material uses and reasoning in relation to light sources and how human see things
3. Engineering approach, including aspect, size, parts that are environmentally-friendly, and other considerations students should explain
4. Time management, collaboration, problem-solving skills
5. And specifically for Lesson 4:
 - Final project design, including all components based on their own merit
 - Their reasoning and explanation for final design
 - Extra credit is students used the *Painter Tool* to color their vehicle, or even coded it

Lesson 5: Presentation and Reflection

Introduction to the Lesson

Teacher asks the students to write about their project and design assessment using the game's photo essay tools.

Game Sandbox Activity (30 minutes)

Photo Essay

1. Using the game's Mission Log, students finalize their photo essay about the project.
2. In the photo essay, students should organize and name photos by activity and stage of the project, and insert them into their essay.
3. For example, some questions students might be asked to answer in their photo essay, may include:
 - Why is light important in order to see objects in the dark?
 - How can lights help in keeping the a community or a farmland safe?
 - What happens when light sources shine on different objects?
 - How are shadows casted?
 - How do watch towers/light house benefit the safety of the farmlands and the community in general?
 - What shapes and materials should be used to create a watch tower for farmland and crops' safety?
 - How many blocks and what kinds of blocks were used?
 - What were the differences in design considerations and materials for each? And why?
 - What changes did you make after the initial prototype and why?
 - What else would you have done, or do differently if you had more time?

Assessment: Post-test about about light sources (10 minutes)

Final Assessment

1. Photo essay
2. Post-test
3. Previous assessments made during the other lessons

Teacher Handy Links and Resources

From Us to You!

- Want to know about the role of light to sight? [READ HERE.](#)
- How do we see light? [READ HERE.](#)
- There are countless sources of light but they can all be categorized under either of the two following categories. [READ HERE.](#)
- Read about the structures of a light house. [READ HERE.](#)

Other Multimedia Resources

- Check out this video on light energy sources. [WATCH HERE.](#)
- Have you ever thought what would we do without lights? Check this video out. [WATCH HERE.](#)
- Watch and learn about light houses. [WATCH HERE.](#)

Other Reference Material

- Australian Curriculum (ACARA) Science Sequence of Content F-6: Strand [READ](#)

Support & Help

Please feel free to contact the STEAM Craft Edu team for any inquiries or support needs

Email: education@steamcraftedu.com