



SPRINGFIELD PUBLIC SCHOOLS
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Springfield Public Schools
Springfield, New Jersey 07081

Science
Grade 2

Curriculum Guide

2026

This curriculum may be modified through varying materials, techniques, and strategies as per an individual student's IEP.

Springfield Board of Education
Approved July 27, 2026



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Springfield, New Jersey**

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Springfield Public Schools

Cultivating compassionate and extraordinary learners!

EXTRACT OF THE MINUTES OF A MEETING OF
THE BOARD OF EDUCATION OF
THE TOWNSHIP OF SPRINGFIELD
COUNTY OF UNION, NEW JERSEY
AS RECORDED IN THE OFFICIAL MINUTE BOOK

Resolution: 21

Introduced By: Mrs. Gamarekian

Seconded By: Vice President Rinaldi

Adopted: July 27, 2026

Curriculum Adoption

To approve the following new and revised curriculum and courses for the 2026-2027 school year:

1. High School Courses

- a. AP Cybersecurity (new course)
- b. AP Business with Personal Finance (new course)
- c. AP Biology
- d. AP Chemistry
- e. AP Physics I
- f. PLTW Robotics and Automation
- g. PLTW Introduction to Engineering Design
- h. PLTW Principles of Engineering
- i. Biology
- j. Biology Honors
- k. Chemistry
- l. Chemistry Honors
- m. Conceptual Physics
- n. Physics
- o. Environmental Science
- p. Forensics
- q. Human Anatomy and Physiology
- r. Oceanography
- s. Science 8
- t. Molecular Biology Research Lab (new course)

2. Middle School Courses

- a. Science 6
- b. Science 7

3. Elementary School Courses

- a. Kindergarten Science
- b. Grade 1 Science
- c. Grade 2 Science

(continued)

I, Michelle Calas, School Business Administrator/ Board Secretary of the Springfield Board of Education, hereby certify that the extract from the minutes of a meeting of the Board of Education duly called and held on July 27, 2026 has been compared by me with the original minute book of said Board of Education, and is a true, complete and exact copy thereof, as far as the same relates to the subject matter to on said extract.

In WITNESS THEREOF, I have hereunto set my hand and seal of the Springfield Board of Education, this 28th day of July 2026.

SEAL



Michelle Calas

School Business Administrator/ Board Secretary



Unit Overview Template

Content Area: Science

Grade Level: 2

Unit Title: Animal
Adventures

Unit Summary: In this second-grade life science and engineering design unit, students become active field biologists and habitat restoration engineers to explore the fundamental connections between animal traits, environmental resources, and global biodiversity. Students begin by stepping into the shoes of early global explorers, learning how to observe past surface camouflage to classify living organisms. By analyzing skeletal structures and reproductive histories, they sort animals into distinct categories, discovering how to track complex biological patterns.

Students then transition to analyzing active habitats, conducting timed observational sweeps of both natural desert landscapes and man-made urban spaces. They discover how living things depend on their environment for food, water, and safety, calculating how localized resources dictate species diversity. The unit culminates in an engineering design challenge where students synthesize their knowledge to solve a real-world problem: how to attract a specific target animal to a designated area. By designing, drawing, and optimizing a custom structural bird feeder that caters to explicit food preferences, students prove that manipulating environmental resources directly alters local ecosystem biodiversity.

Primary Interdisciplinary Connections: Mathematics and ELA

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

Unit Rationale: The living world is full of rich, interconnected variations that second-grade students witness daily, yet they often struggle to move beyond surface-level traits like color or size when evaluating organisms. This unit bridges that gap by anchoring abstract evolutionary biology and ecosystem dynamics into highly relatable, interactive field simulations—such as desert mountain cliffs, park playgrounds, and vocal evening ponds. Understanding animal characteristics shifts students from arbitrary sorting to rigorous scientific classification, allowing them to see how internal anatomy and birth patterns reveal structural relationships. Similarly, measuring species frequency across varying habitats provides a concrete mathematical foundation for understanding how living and non-living resources drive ecological balance. By concluding with an engineering task centered on selective animal attraction, this unit demonstrates the purposeful application of life science. Students learn that ecological conservation is an active engineering field, where humans intentionally design tools to manage, support, and protect local wildlife populations.

Career Readiness (Standard 9):

9.4.2.CT.3: Use a variety of types of thinking to solve problems.

9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.

9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.

9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.



Learning Targets

Standards: 2-LS4, K-2-ETS1

Content Statements: Ecosystems: Interactions, Energy, and Dynamics; Engineering Design

CPI#:	Cumulative Progress Indicator (CPI):
2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
SL.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by linking their explicit comments to the remarks of others. C. Ask for clarification and further explanation as needed about the topics and texts under discussion.
2.M.A.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
2.DL.A.1	Understand that people collect data to answer questions. Understand that data can vary.
SEL.PK-12.4.1	Develop, implement and model effective problem solving and critical thinking skills.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.2.3	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.
8.2.2.ITH.3	Identify how technology impacts or improves life.
8.2.2.ITH.4	Identify how various tools reduce work and improve daily tasks.
8.2.2.ITH.5	Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.
8.2.2.ETW.1	Classify products as resulting from nature or produced as a result of technology.
8.2.2.ETW.2	Identify the natural resources needed to create a product.



8.2.2.ETW. 3	Describe or model the system used for recycling technology.
8.2.2.ETW. 4	Explain how the disposal of or reusing a product affects the local and global environment.
8.2.2.EC.1	Identify and compare technology used in different schools, communities, regions, and parts of the world.
Science and Engineering Practices	
Planning and Carrying Out Investigations	



Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (2-LS4-1)

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2- ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Disciplinary Core Ideas

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2- ETS1-1)
- Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2- ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2- ETS1-1)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)



Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Unit Essential Questions:

- What are anatomical characteristics, and how do scientists look past surface patterns to group the world's diverse animals?
- How do the living and non-living parts of an environment determine the diversity of organisms that can survive there?
- How can we use our knowledge of an animal's unique structural and dietary needs to engineer a device that alters local habitat biodiversity?

Unit Enduring Understandings:

- Animals share distinct internal and external characteristics that allow them to be systematically grouped into biological categories like mammals, birds, reptiles, and invertebrates.
- A habitat is a complex system that must provide food, water, and protection from predators, and variations in these resources directly control species diversity.
- Humans can deliberately design and position structural devices, such as selective bird feeders, to meet the specific requirements of target wildlife populations.

Unit Learning Targets:

Students will....

- Plan and conduct collaborative sorting investigations that group 16 diverse specimens into four categories using internal bones and birth methods as key traits.
- Analyze and interpret animal populations across distinct environments by constructing single-unit scale bar charts to calculate biodiversity differentials.
- Evaluate acoustic data sets from two distinct aquatic ecosystems to determine how water permanence influences species richness.
- Design, sketch, and build a physical model of a bird feeder that uses specific geometric shapes and materials to selectively attract a target bird species.



Evidence of Learning

Summative Assessment: Unit Assessment

Equipment Needed: Mystery Science Kit

Teacher: Mystery Science Online Program

Resources:

Formative Assessments:

- The 4-Category Animal Matrix Check: A performance-based classification task where students utilize a multi-tier trait framework to successfully group 16 standard and 3 anomalous challenge organisms.
- The Dual-Habitat Population Chart: A data literacy assessment where students record species frequencies using an X-tally grid across timed virtual field sweeps to generate single-unit bar graphs.
- The Aquatic Acoustic Bio-Indicator Grid: An auditory analysis where students filter overlapping outdoor soundscapes to catalog frog species and contrast seasonal pool counts with permanent lake biodiversity.
- The Selective Bird Feeder Design Blueprint: An engineering assessment where student pairs sketch a custom feeder structure, explicitly matching its structural features and seed choices to the unique anatomical preferences of a target bird.



Lesson Plans

Lesson	Time Frame
Lesson 1 How many different kinds of animals are there?	2 days
Lesson 2 Why would a wild animal visit a playground?	2 days
Lesson 3 Why do frogs say "ribbit"?	2 days

Teacher Notes:

This unit shifts between heavy mathematical graphing, auditory isolation, and structural design. Ensure student workstations are equipped with graphing grids and clear visual sorting mats before beginning the classification runs.

When managing the acoustic and virtual field sweep labs, expect a high level of collaborative noise as students negotiate raw counts. Establish a simple non-verbal callback signal—such as an outspread "bighorn ledge check"—to instantly freeze student movement and transition teams into silent data-entry postures. Emphasize the relationship between structure and function during the engineering phase; push students to explain why specific physical openings or tray depths on their feeder models will exclude non-target animals while accommodating their chosen species.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:
mysteryscience.com



Lesson Plan 1 Template

Content Area: Science Lesson Title: How many different kinds of animals are there? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: Digital classroom projection system to display historical archive drawings of early "camelopard" discoveries and global habitat maps, paired with live-updating digital tally boards for group classification consensus.

Equipment Needed: Printed sets of 16 double-sided animal characteristic cards, 3 specialized challenge cards (hippopotamus, tarantula, pangolin), safety child scissors, student data-collection grids, and uniform plastic connecting links to build concrete bar graphs.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will identify and define characteristics as specific anatomical or behavioral traits used by scientists to group living things. - Students will construct a functional 4-category sorting matrix to classify diverse animal specimens based on internal skeletal structures and birth methods. - Students will manipulate a 16-point raw data set to build a single-unit scale bar graph tracking	Lesson Sequence - Phenomenon: A scientist exploring a dense rainforest notices a strange, armored creature with thick scales like a reptile, yet it has fine hairs peeking out between its plates and nurses its live-born babies just like a forest mouse. - The Camelopard Discovery Hook: The teacher introduces the historical concept of a "room of wonder," telling the story of early European explorers who	- Students will verbally define a characteristic as a specific structural or behavioral feature used to identify and group animals. - Students will execute a data-mapping task, accurately counting category card totals and creating a single-unit scale bar graph that reflects their sorting data. - Students will complete their 4-tier classification array, correctly matching 16 distinct animal cards



animal biodiversity counts.

- Students will collaborate with a partner to debate, analyze, and justify the classification of non-traditional challenge organisms using structural patterns.

encountered a massive, tall creature with leopard spots in Africa, naming it a "camelopard" before modern cameras existed.

3. The Giraffe Photo Reveal: The teacher projects a real photograph of a giraffe, showing how initial artistic descriptions can be imperfect and prompting partners to discuss how they would convince friends back home that a strange animal is real.
4. The Color-Grouping Trap Challenge: The teacher displays a jumbled collection containing a brown frog, a brown beetle, and a brown horse, challenging students to decide if sharing a single color trait means these animals are truly the same kind.
5. Characteristic Vocabulary Introduction: The teacher defines the scientific term characteristic inline (a specific body part, structural trait, or way an organism looks and grows), illustrating why looking past surface colors reveals deeper biological patterns.
6. The Three-Pronged Scientific Search: The teacher frames the investigation rules, explaining that modern zoologists classify animals by evaluating

to their proper biological categories.

- Students will verbally explain why a scaly pangolin is scientifically classified as a mammal rather than a reptile by citing live birth and hair traits.



- outside coverings (fur, feathers, scales), inside support frameworks (bones vs. no bones), and ancestral origins (eggs vs. live birth).
7. Card Assembly Loop: Students work in collaborative partnerships to cut out 16 double-sided animal profile cards, spreading them across their workstation desks to preview the structural text descriptions printed on the reverse sides.
 8. The Open Exploration trial: Partnerships spend two minutes performing an unguided sort of the animal cards, noticing how tricky it is to organize a massive collection without a standardized sorting protocol.
 9. The Bone Matrix Isolation: Following a teacher cue, students isolate the internal structural variable, reading the text clues to separate all cards into two distinct piles: animals with internal skeletons and animals with no bones.
 10. Mammal and Bird Sorting Runs: Students create labeled sorting zones on paper sheets, grouping specimens that give birth to live young and possess hair into the



- "Mammals" category, and organisms with feathers into the "Birds" category.
11. Reptile and Invertebrate Calibration: Teams place the remaining scale-covered egg-layers into the "Reptiles" zone, while depositing the bone-free organisms into the "Invertebrates" sector to finish the 4-category classification map.
 12. The Connecting Link Math Conversion: Moving into the data phase, students count the final card totals in each of their four categories, laying down matching numbers of plastic connecting links end-to-end to build concrete bar graphs of their biodiversity counts.
 13. The Single-Unit Grid Transfer: Students translate their physical link dimensions onto paper graphing grids, drawing a single-unit scale bar chart and answering comparative math questions to see which animal group has the highest population frequency.
 14. The Triple-Threat Challenge Confrontation: The teacher distributes three complex challenge cards (Hippo, Tarantula, Pangolin), instructing partnerships to ask specific structural



- questions to crack the classification codes.
15. Pangolin Pattern
Synthesis Wrap-Up: The class reflects on their findings, discovering that while a tarantula's hair might mimic a mammal, its lack of bones makes it an invertebrate, and while a pangolin looks like a reptile, its live-birth history and hair-derived scales prove it is a true mammal.

Differentiation:

- High-contrast colored border highlights are printed on the sorting sheets to help students with visual-spatial processing needs easily find the boundaries of the four categories.
- Pre-cut card bundles are given to student pairs experiencing fine-motor or gripping challenges to ensure immediate entry into the intellectual classification phase.
- Picture-supported vocabulary anchor charts are displayed on the main projection wall, directly linking the words mammal, reptile, bird, and invertebrate to graphic body icons.
- Advanced students can use their completed bar graphs to write and solve custom multi-step "how many more" comparison math equations, sharing them with another advanced pair.
- Sentence frames are provided for classification analysis: "I know the [blank] belongs in the invertebrate group because it lacks an internal [blank] and lays [blank]."

Resources Provided:

- Mystery Science biodiversity video modules, curiosity cabinet historical archives, and interactive single-unit graphing frameworks.
- Mystery Pack (3 sets of challenge organism profile sheets, pre-labeled category boundary mats, and data-tracking cards).
- Classroom lab tables, child-safe cutting tools, grid paper sheets, and non-standard plastic counting links.



Lesson Plan 2 Template

Content Area: Science Lesson Title: Why would a wild animal visit a playground? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: Digital classroom projection system to display interactive 90-second virtual habitat expeditions and trail camera footage of nocturnal predators, paired with a synchronized digital audio timer to manage timed biodiversity tracking sweeps.

Equipment Needed: Heavyweight student Habitat Journals, fine-point marking pencils, individual standard 12-inch rulers, high-contrast habitat observation guides, and large color-coded classroom wall charts tracking desert vs. park variables.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will identify and define a habitat as an environmental system that provides specific survival necessities including food, water, and protection from predators. - Students will construct a dual-habitat observation grid, utilizing a structured X-tally protocol to record organism frequencies across timed virtual trials.	Lesson Sequence - Phenomenon: On a scorching summer afternoon, a herd of wild, skittish bighorn sheep descends a steep mountain slope to casually graze on a lush green playground lawn in Nevada, yet as soon as darkness falls, they abandon the abundant food to retreat back into the barren, arid desert cliffs. - The Bighorn Swing Set Hook: The teacher projects a photograph of	- Students will verbally define a habitat as a specific environment that provides an organism with its fundamental needs for food, water, and physical safety. - Students will execute a data-tracking task, successfully capturing animal frequencies using an X-matrix structure during two independent 90-second habitat trials. - Students will complete their comparative data charts, correctly



- Students will manipulate their raw data sets to build and interpret comparative frequency charts tracking wildlife counts in artificial versus natural environments.
- Students will collaborate with a partner to evaluate spatial constraints, estimating physical ledge widths in inches to justify how anatomical adaptations protect prey from large predators.

- wild bighorn sheep resting next to a playground slide in Boulder City, prompting partners to debate why a shy, mountain-dwelling creature would walk directly into a human play space.
3. The Word Explorer Launch: The teacher defines the scientific term habitat inline (the specific home or place where an animal lives and gets what it needs to survive), contrasting natural tropical rainforests and grasslands with man-made park environments.
 4. The Desert Aridity Contrast: The class analyzes the intense climate of the Mojave Desert habitat, mapping how people pump water from miles away to create artificial, lush green oases in the middle of the hottest, driest desert in the United States.
 5. Journal Mechanics Fold: Students work in collaborative partnerships to construct their primary data tools, folding their heavyweight paper sheets along the thick black guidelines and creasing the edges firmly to assemble a four-panel Habitat Journal.

- identifying which habitat possesses higher biological diversity based on their recorded species counts.
- Students will verbally explain the dual-habitat survival loop, explaining why bighorn sheep alternate between the park lawn for nutrition and the mountain cliffs for protection against nocturnal predators.



6. The 15-Second Setup Run: The teacher initiates a rapid 15-second practice trial on the main display screen, instructing students to count bighorn sheep, hawks, lizards, tortoises, and coyotes simultaneously to experience how difficult it is to track multiple raw variables without a systematic system.
7. The Structural Tally Protocol: The teacher introduces the structural data protocol, modeling how to record an "X" in the corresponding vertical box each time an animal enters the field of view to ensure accurate tracking.
8. The Park Expedition Sweep: The teacher activates a strict 90-second digital timer; student pairs conduct their first systematic observation sweep of the park habitat, marking real-time data entries in their journals before summarizing their totals.
9. The Desert Expedition Sweep: Students flip their journals to the Desert Habitat section; the teacher initiates the second 90-second tracking sweep, requiring students to document shifting wildlife



- frequencies in the natural arid terrain.
10. The Biodiversity Count Transfer: Teams compile their data points, building a primary comparison chart to evaluate diversity (the scientific measure of how many different kinds of organisms live in an ecological space), discovering that the desert contains more distinct species than the man-made park.
 11. The Botanist Data Reveal: The teacher introduces a secondary dataset from a plant scientist, showing that while the desert has a wider variety of plants with sharp defensive spines, the park offers an unrestricted volume of pure green grass.
 12. The Ledge Width Estimation Trial: Shifting to physical spatial variables, students use their standard 12-inch rulers to measure out a narrow two-inch boundary line on their desks, estimating and experiencing how small a ledge a bighorn sheep can comfortably stand on compared to a human foot.
 13. The Predator Tracking Phase: The class analyzes video clips of the playground habitat,



- observing the sudden defensive freeze response of the bighorn herd when a predatory coyote approaches the boundary fences.
14. The Vertical Safety Synthesis: Partners review trail camera photographs provided by a wildlife biologist, analyzing how the bighorn sheep utilize steep mountain cliffs at night as a defense mechanism against cougars and bobcats.
15. The Survival Riddle Resolution Wrap-Up: The teacher guides the final synthesis discussion, leading the class to discover that while the artificial playground provides effortless daytime foraging, the steep, rocky ledges of the desert mountains provide critical nocturnal safety where predators cannot follow.

Differentiation:

- Pre-populated animal icon keys are printed directly at the base of each journal column to support students with visual-tracking needs as they log incoming data.
- Extended 15-second pause intervals are programmed between visual segments for student partnerships experiencing fine-motor delays, providing extra time to record tallies.
- Dichotomous visual anchor charts are hung on opposite sides of the room, explicitly mapping the words "Prey (Safety on Cliffs)" and "Predator (Speed on Flat Ground)" with color-coded arrow cues.
- Advanced students can use their calculated totals to write complex comparative statements, analyzing how the ratio of predators to prey alters between the open desert and the enclosed park boundaries.



- Sentence frames are provided for ecological analysis: "During the day, the bighorn sheep travel to the park because the habitat provides abundant [blank], but at night they return to the desert cliffs because the rocky ledges offer protection from [blank]."

Resources Provided:

- Mystery Science habitat simulation video modules, wildlife biologist photo archives, and nocturnal predator movement logs.
- Mystery Pack (Individual student Habitat Journals, pre-printed data collection grids, and high-contrast species identification slips).
- Classroom workspace, standard 12-inch measuring rulers, and data-aggregation wall charts.



Lesson Plan 3 Template

Content Area: Science Lesson Title: Why do frogs say "ribbit"? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: Digital classroom soundscape projection system to broadcast high-fidelity amphibian acoustic tracks and overlay overlapping multi-species audio feeds, paired with a visual spectrogram frequency timer.

Equipment Needed: Specialized Frog Call Onomatopoeia logs, multi-choice ecosystem checkboxes, 12-inch standard rulers to model physical frog dimensions, high-contrast habitat comparison maps, and colored sorting tokens.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will identify and define acoustic communication as a behavioral survival mechanism used by organisms to transmit identity signals and secure reproductive success. - Students will construct an onomatopoeic classification matrix, translating raw auditory signals into descriptive, repeatable written word codes. - Students will manipulate overlapping multi-species	Lesson Sequence - Phenomenon: On a warm spring evening, a quiet, local pond erupts into a chaotic, loud symphony of high-pitched trills, deep guttural grunts, and mechanical growls, yet a female frog navigating the dark water can instantly isolate and locate a single mate belonging exclusively to her own matching biological group. - The Nighttime Window Symphony Hook: The teacher projects a dark bedroom window scene	- Students will verbally define communication as the process of using distinct sensory signals like sound or light to send important messages to others. - Students will execute an acoustic-decoding task, accurately identifying hidden amphibian species from complex, multi-layered outdoor audio recordings. - Students will complete their comparative ecosystem data charts, successfully documenting



acoustic data sets to isolate, filter, and chart individual animal frequencies within localized habitats.

- Students will collaborate with a partner to contrast environmental constraints, analyzing seasonal moisture data to explain why permanent water systems contain greater species diversity than seasonal vernal pools.

paired with ambient evening outdoor sounds, recalling childhood confusion over whether the noises are just "the sound of the night" or specific creatures.

3. The Cricket Vibration Reveal: The teacher displays close-up footage of a cricket rapidly rubbing its wings together to produce a rhythmic chirp, establishing that every natural sound has a specific physical source.
4. The Swamp Eye-Shine Mystery: The teacher shares the story of a nighttime trek to a muddy marshland where a flashlight beam catches two small glowing spots peeking over the water line, revealing a hidden frog.
5. Amphibian Vocabulary Calibration: The teacher defines the scientific distinction between frogs and toads inline, explaining that a toad is a specific type of frog distinguished by rough, warty skin, a stocky body, and terrestrial habits.
6. The Reproductive Signal Framework: The teacher introduces the underlying biology of frog vocalizations, explaining that only male frogs emit loud calls to signal their

the higher species count present in permanent water bodies versus seasonal pools.

- Students will verbally describe why a frog's jelly-like eggs prevent it from reproducing in dry terrestrial environments, linking life-cycle survival directly to continuous water access.



- precise locations to females for egg-laying.
7. Species-Specific Frequency Isolation: The teacher explains the concept of species-specific calling, illustrating how a unique acoustic signature ensures that animals only attract mates of their exact matching biological species amidst a loud swamp.
 8. The Onomatopoeia Data-Capture Run: The teacher distributes the Frog Call Logs; students listen to a solo recording of a Wood Frog, debating its tonal quality with a partner before writing down descriptive sound keywords (e.g., "cluck" or "quack").
 9. Auditory Cataloging Loops: The class moves through consecutive calibration trials, listening to, analyzing, and phonetically logging the distinct calls of the Spring Peeper ("cheep"), American Bullfrog ("grum"), Northern Leopard Frog ("growl"), and American Toad ("trill").
 10. The 12-Inch Specimen Scaling Trial: Shifting to spatial physical properties, students use standard 12-inch rulers to map out the physical length of an American



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- Bullfrog, comparing its large scale to small regional tree frogs to link body mass with deep vocal pitch.
11. The Oakwood Pond Acoustic Sweep: The teacher plays an overlapping dual-species soundscape recorded at Oakwood Pond; student partnerships cooperate to filter the competing frequencies, checking off the active species on their data sheets.
 12. The Swede Lake Multi-Variable Challenge: The teacher increases the complexity, broadcasting a four-species audio sequence from Swede Lake; students track the acoustic inputs in real time to isolate the distinct sound layers.
 13. The Moisture-Variable Matrix Analysis: Teams transfer their habitat checkboxes into a comparative frequency chart, discovering that Swede Lake maintains significantly higher biological diversity than Oakwood Pond.
 14. The Vernal Pool Desiccation Synthesis: The class analyzes seasonal environmental data, discovering that Oakwood Pond is a temporary wetland that dries up entirely by summer, whereas Swede



- Lake remains wet all year.
15. The Jelly-Egg Survival Wrap-Up: The teacher guides the final structural synthesis, explaining that because shell-less frog eggs look like soft balls of jelly and tadpoles require continuous water to breathe, permanent aquatic habitats naturally sustain greater species richness, peaking in the high-humidity Amazon Rainforest.

Differentiation:

- Pre-printed onomatopoeia spelling suggestion words are listed at the top of the worksheet columns to assist students with phonemic translation and writing tracking needs.
- Extended 30-second isolation replays of individual frog calls are provided for student partnerships experiencing auditory processing adjustments, allowing them to verify sounds before marking.
- Graphic habitat profile cards depicting "Wet All Year" vs. "Dries Up In Summer" are displayed on the active projection wall using clear blue and yellow visual cues.
- Advanced students can use their calculated species totals to compute fractions or comparative statements detailing the ratio of trilling species to growling species across both local water habitats.
- Sentence frames are provided for vocalization analysis: "I know the frog making the high-pitched peeping sound is a [blank] because its call matches the word [blank] on my scientific sound log."

Resources Provided:

- Mystery Science acoustic bio-indicator software, regional amphibian sound libraries, and tropical rainforest biodiversity maps.
- Mystery Pack (Individual student Onomatopoeia Log sheets, multi-habitat checkboxes, and visual species profile reference cards).
- Classroom lab desks, standard 12-inch measurement tools, and collective data-tracking wall charts.



Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly*, *Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☒	☐	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☒	☐	☐
Integrate 21st century skills	☒	☐	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Science	Grade Level: 2	Unit Title: Animal Adventures
Created: 2026	Board Approved on: Type Here	



Unit Overview Template

Content Area: Science **Grade Level:** 2 **Unit Title:** Plant Adventures

Unit Summary: In this second-grade life science and engineering design unit, students step into the roles of agricultural botanists and ecological design engineers to explore how plants interact with the living and non-living world to survive, reproduce, and thrive. Students begin by unraveling a global geographic mystery: how heavy native trees travel across vast oceans without human assistance. Through hands-on aerodynamic drop tests and friction-based mechanical trials, students build functional models of diverse seed structures. They discover the fascinating mechanics of seed dispersal, evaluating how wind currents and animal vectors like fur and digestive tracts carry seeds far away from their parent canopy to prevent resource overcrowding. Students then transition to direct environmental experimentation, planning and conducting fair tests to isolate the exact variables required for a seed to sprout and an adult plant to remain healthy. By systematically restricting access to water, soil, and sunlight, they gather direct physical evidence of cause-and-effect relationships within plant lifecycles. The unit culminates in a biomimicry engineering design challenge where students synthesize their discoveries. Using their knowledge of how flowers rely on animal partners for pollination, students sketch, build, and optimize custom physical tools that replicate the fuzzy, high-friction surfaces of insects and the sticky surfaces of floral anatomy. Through this process, they demonstrate that biological shapes and structures are perfectly organized to fulfill vital survival functions.

Primary Interdisciplinary Connections: Mathematics and ELA

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

Unit Rationale: Plants are a constant presence in the daily lives of second-grade students, yet children frequently view them as passive, inanimate objects rather than active, dynamic organisms with strict survival requirements. This unit bridges that gap by anchoring fundamental concepts of botany, evolutionary morphology, and ecosystem dependency into highly interactive, physical simulations—such as exploding seed pods, hitchhiking burrs, and competing canopy seedlings. Investigating seed dispersal shifts students from simply identifying plant parts to analyzing form and function. By testing how variations in geometric shapes—like helicopter wings, aerodynamic gliders, or hooked prickles—interact with air and animal fur, students realize that a plant's physical architecture directly dictates its reproductive success. Furthermore, conducting controlled growth trials moves students away from rote memorization of plant needs and into active, data-driven scientific inquiry where they must use physical evidence to defend their claims. Concluding with a design challenge focused on pollination dynamics highlights the deep, interconnected mutualisms that sustain global ecosystems. Students learn that human engineering can learn powerful lessons from nature, using biological patterns to solve complex structural problems in agriculture and environmental conservation.

Career Readiness (Standard 9):

9.4.2.CT.3: Use a variety of types of thinking to solve problems.



- 9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.
- 9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.
- 9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.
- 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.

Learning Targets

Standards: 2-LS2; 2-LS4; K-2-ETS1

Content Statements: Ecosystems: Interactions, Energy, and Dynamics; Biological Evolution: Unity and Diversity; Engineering Design

CPI#:	Cumulative Progress Indicator (CPI):
2-LS2-1	Plan and conduct an investigation to determine if plants need sunlight and water to grow.
2-LS2-2	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
SL.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by linking their explicit comments to the remarks of others. C. Ask for clarification and further explanation as needed about the topics and texts under discussion.
2.M.A.4	Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
2.DLA.1	Understand that people collect data to answer questions. Understand that data can vary.
SEL.PK-12.4.1	Develop, implement and model effective problem solving and critical thinking skills.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.2.3	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.

Science and Engineering Practices



Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2), (K-2-ETS1-2)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)
- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (2-LS4-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2), (secondary to 2-LS2-2)

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2), (K-2-ETS1-2)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Unit Essential Questions:

- How do the physical shapes and structures of seeds determine how far they can travel away from their parent plant?



- What are the core environmental variables that seeds and adult plants must secure from their surroundings to live and grow?
- How do plants and animals form cooperative relationships to ensure successful pollination and seed production?

Unit Enduring Understandings:

- Plants grow unique structures around their seeds that leverage wind, water, or animal movements to disperse across wide geographic areas.
- Plants depend directly on non-living environmental resources, specifically water and light, to grow, reproduce and sustain themselves.
- Many flowering plants rely on specific animal behaviors and physical structures to transfer pollen between blossoms, creating a mutually beneficial survival loop.

Unit Learning Targets:

Students will....

- Design, construct, and test paper models of three distinct seed structures to analyze how aerodynamic variations alter flight trajectories and descent speeds.
- Plan and conduct collaborative investigations that isolate light and water variables to determine their exact impacts on seedling development and structural health.
- Measure, record, and chart the retention rates of texturized versus smooth seed variants on simulated animal fur to evaluate transport efficiency.
- Engineer, draw, and optimize a custom mechanical tool that mimics the high-friction, fuzzy exterior of a pollinator to successfully capture and transfer simulated pollen grains to a sticky stigma.



Evidence of Learning

Summative Assessment: Unit Assessment

Equipment Needed: Mystery Science Kit

Teacher: Mystery Science Online Program

Resources:

Formative Assessments:

- The Flight Architecture Drop Ledger: A performance-based testing checkpoint where students log drift distances and flight behaviors of custom-folded maple, rain tree, and koa seed models.
- The Controlled Variable Growth Log: A data-tracking task where students monitor plant height, leaf count, and stem rigidity across groups stripped of light or hydration resources.
- The Fluffadoo Retention Matrix: A mathematical data sheet where student pairs record the exact hop-counts sustained by texturized felt seeds versus smooth plastic beads before mechanical detachment occurs.
- The Biomimicry Pollinator Tool Blueprint: An engineering design evaluation where students produce technical sketches and physical models of a custom tool, proving its capacity to pick up and deposit colored indicator powder across separate artificial blossoms.



Lesson Plans

Lesson	Time Frame
Lesson 1 How did a tree travel halfway around the world?	2 days
Lesson 2 Why do seeds have so many different shapes?	2 days
Lesson 3 Why do you find flowers and bees together?	2 days

Teacher Notes:

This unit requires careful management of timing and materials, as it transitions between active physical testing, auditory processing, and multi-week botanical observation. Prepare a dedicated classroom window ledge or grow-light zone well in advance to accommodate the seedling resource-deprivation trays without disrupting daily desk space. When executing the kinetic seed-dropping and animal-hopping labs, prepare for an energetic, movement-heavy classroom environment. Establish a clear, quiet auditory callback signal—such as an imitating bird call or a non-verbal "branches up" posture—to instantly freeze student movement and smoothly transition teams back into independent data entry. During the engineering and modeling phases, consistently prompt students to look past aesthetic features and focus heavily on mechanics. Push them to explain the exact physics of their designs, describing why a certain texture creates higher friction or how a specific shape alters aerodynamic resistance to fulfill its biological function.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:
mysteryscience.com



Lesson Plan 1 Template

Content Area: Science	Lesson Title: How did a tree travel halfway around the world?	Time Frame: 2 days
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Lesson Components

21st Century Themes

- | | |
|--|---|
| ☒ Global Awareness | ☐ Financial, Economic, Business and Entrepreneurial Literacy |
| ☒ Civic Literacy | ☒ Health Literacy |

21st Century Skills

- | | | |
|---|---|--|
| ☒ Creativity and Innovation | ☒ Critical Thinking and Problem Solving | ☒ Information Literacy |
| ☒ Life and Career Skills | ☒ Communication and Collaboration | ☒ Media Literacy ☐ ICT Literacy |

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: Digital classroom projection system to display high-resolution side-by-side botanical comparisons of Hawaii and Réunion island canopy systems, paired with a synchronized multimedia countdown timer to govern aerodynamic dropping iterations.

Equipment Needed: Heavyweight paper model seed printouts (maple, rain tree, and koa templates), standard metal paperclips, student child-safe scissors, 12-inch measuring rulers, and high-visibility classroom drop-zone mats.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will identify and define dispersal as the scientific process by which a plant spreads its seeds away from the parent plant to maximize survival rates. - Students will construct functional paper models of three distinct seed profiles (twirling, coasting, and tumbling) to simulate real-world aerodynamic structures. - Students will manipulate physical structural properties, adding uniform metal paperclips to simulate seed mass	Lesson Sequence - Phenomenon: A massive, heavy koa tree native only to the isolated volcanic islands of Hawaii is discovered growing naturally thousands of miles away on Réunion Island in the Indian Ocean, despite having no humans present to plant it and lacking waterproof seeds that can survive saltwater ocean currents. - The Crimson Wood Hook: The teacher introduces the historical value of Hawaiian koa wood, showing images of deep red ukuleles, native	- Students will verbally define dispersal as the biological mechanism where seeds travel away from a parent plant to find open space, sunlight, and soil to grow. - Students will execute a data-mapping task, logging drift distances across three model types to determine which shape maximizes wind interaction. - Students will complete their comparative seed charts, correctly matching the structural adaptations of twirling, gliding, and edible seeds



center points during controlled altitude drops.

- Students will collaborate with a partner to contrast flight behaviors, measuring and charting horizontal drift distances to evaluate whether wind patterns can account for transoceanic migration.

bowls, and massive sea-faring canoes, explaining that for centuries people believed this giant tree grew nowhere else on Earth.

3. The Réunion Island Climax: The teacher projects a map showing Réunion Island located halfway around the globe, revealing the shocking discovery of an identical tree line displaying the exact same fluffy flowers, blade-shaped leaves, and deep red timber.
4. The Seed Dispersal Riddle: The teacher introduces the paradox: a mature koa tree is far too heavy for transoceanic transport, meaning the migration had to happen at the seed stage, long before humans ever crossed the oceans.
5. Plant Structure Vocabulary Introduction: The teacher defines the scientific term structure inline (the specific physical shape, parts, or outer boundaries of an organism), illustrating how a plant's physical form dictates how it interacts with wind and gravity.
6. The Dandelion Parachute Analysis: The class evaluates the dandelion's fluff architecture, analyzing how specialized structures prevent

to their primary environmental transport vectors.

- Students will verbally explain why a small, un-winged seed like the koa can achieve global distribution, linking its compact structure to animal-assisted long-distance transport.



- thousands of seeds from dropping straight down into a single crowded, low-resource soil zone.
7. Aerodynamic Model Engineering Loop: Students work in collaborative partnerships to cut out their paper seed templates, following precise step-by-step structural instructions to assemble three distinct profiles: a dual-flap helicopter Maple model, a curved loop Rain Tree model, and a flat-folded Koa model.
 8. Mass Center Calibration: Students slide a standard metal paperclip onto the designated base of their Maple model, discovering how localized weight distribution acts as the seed kernel to stabilize structural rotation through space.
 9. The High-Branch Maple Drop: Students stand beside their workstations, extending their arms over their heads like forest branches to execute a series of controlled drops, observing how the dual flaps catch air currents to initiate rapid, helicopter-like spinning.
 10. Horizontal Dispersal Charting: Partners measure the distance from their dropping point to the final landing zone



- using standard 12-inch rulers, logging how aerodynamic lift slows descent velocity and allows ambient breezes to carry seeds away horizontally.
11. The Rain Tree Glider Sweep: Teams pivot to the Rain Tree model, holding the looped paper form sideways before dropping, documenting how asymmetrical curves alter the air resistance to create tumbling, erratic sideways trajectories.
 12. The Flat Koa Gravity Run: Students drop the flat, streamlined Koa model, observing that while its elongated edge generates a rapid flip-flop tumble, it lands significantly closer to the dropping axis than the specialized Maple or Rain Tree gliders.
 13. The Ocean Current Barrier Analysis: The class evaluates alternative transit methods, examining why the lack of a hard, thick protective shell prevents thin-walled koa seeds from traveling via ocean saltwater without rotting.
 14. The Animal Vector Investigation: The teacher displays a sweet cherry seed to transition from wind to wildlife vectors, tracking how fruit consumption allows



- small animals to carry un-winged seeds inside their digestive tracts across long distances.
15. The Avian Transoceanic Synthesis Wrap-Up: The lesson closes with a global flight-path animation, revealing that migratory birds swallowed the tiny, snackable koa seeds in Hawaii and deposited them onto the shores of Réunion Island, demonstrating that small seed structures can leverage animal wings to navigate across global boundaries.

Differentiation:

- Pre-marked bold cutting guidelines and high-contrast stop-sign icons are printed onto the templates to guide students with visual-spatial processing needs.
- Pre-creased paper folding sheets are provided to student pairs experiencing fine-motor or joint-coordination challenges to expedite entry into the flight trials.
- Graphic-supported vocabulary anchor charts are hung on the side displays, connecting the terms "Wind Dispersal (Wings/Fluff)" and "Animal Dispersal (Fruit/Snacks)" to bright pictorial icons.
- Advanced students can use their measured drift data to design and execute a secondary test modification, adding multiple paperclips to evaluate how altering seed weight changes aerodynamic velocity.
- Sentence frames are provided for flight analysis: "When I dropped the maple model, its dual flaps caused it to [blank] through the air, which helps a real tree spread its seeds farther away when the [blank] blows."

Resources Provided:

- Mystery Science global seed-migration software, historic Hawaiian botanical catalogs, and bird migration path visualizers.
- Mystery Pack (3 printed versions of aerodynamic model sheets, high-weight calibration paperclips, and data collection grids).
- Classroom workspace, standard 12-inch measuring rulers, and collaborative habitat data-tracking wall charts.



Lesson Plan 2 Template

Content Area: Science Lesson Title: Why do seeds have so many different shapes? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to broadcast slow-motion botanical footage of exploding seed pods alongside macro photography of animal hair weaving into hooked seed structures, utilizing an integrated interactive class interval tally grid.

Equipment Needed: Large standard plastic cups, clean white cotton balls, child-safe liquid craft glue, custom die-cut felt Seed A models, smooth plastic bead Seed B models, student data log sheets, and digital timer displays.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define animal dispersal as the process where a seed utilizes an animal vector to travel away from its parent plant. - Students will construct a physical animal fur model by manipulating and adhering texturized cotton elements onto a structural base. - Students will execute a comparative kinetic trial to track how structural differences between texturized and smooth	Lesson Sequence - Phenomenon: Certain plant species grow seed pods that physically explode upon contact, while other plants grow seeds covered in sharp hooks, sticky fuzz, or thick waterproof husks that allow them to travel massive distances without any active movement of their own. - The Exploding Pod Hook: The teacher projects a slow-motion video showing a green touch-me-not seed pod	- Students will verbally explain animal dispersal as a process where seeds hitch rides on or inside animals to find open spots to grow. - Students will complete a comparative trial table, successfully calculating whether texturized or smooth structural traits optimize exterior animal transport. - Students will write a brief summary connecting the physical hooks of a real-world seed to its



bodies alter mechanical friction.

- Students will record and compare numerical data from multiple drop tests, organizing information onto a shared recording sheet to identify performance patterns.

bursting open violently upon a gentle human finger touch, scattering seeds into the air.

3. The Structure Structural Definition: The teacher introduces the term structure inline (the specific physical shape, form, or parts of a living thing) to explain how every unique seed outer covering serves a functional purpose.
4. The Hook and Loop Analogy: The teacher demonstrates a patch of hook-and-loop fastener, explaining how the micro-hooks grip onto soft fiber loops just like wild burrs latch onto passing biological organisms.
5. The Fluffadoo Fur Fabrication: Students coat the curved upper surface of a plastic cup with liquid glue, pressing six cotton balls close together to eliminate open gaps and simulate a dense mammal pelt.
6. Animal Face Creation: Students draw a custom creature visage on the front surface of their cup to personalize their experimental testing model.
7. The Motion Standardization Routine: The teacher models the exact parameters of a controlled hop,

ability to travel far from the parent shade zone.

- Students will identify at least two distinct environmental resources that seedlings must compete for if they fail to disperse away from their origin point.



- instructing students to maintain anchored elbows by their ribs to keep vertical acceleration forces uniform across all groups.
8. The Texturized Seed Engagement: Student pairs place the texturized felt Seed A into a recess between the cotton tufts, simulating an animal brushing past a low-lying forest bush.
 9. The Texturized Seed Drop Trial: The designated hopper conducts fifteen consecutive controlled hops while the partner tracks the exact count at which mechanical separation occurs.
 10. The Smooth Seed Contrast Sweep: Students substitute the felt for the smooth plastic bead Seed B, executing an identical hopping progression to evaluate how a lack of gripping structures affects transit endurance.
 11. Job Rotation Protocol: Partners exchange operational roles, transitioning the data recorder into the primary hopper to secure a secondary independent replication set.
 12. Mathematical Data Logging: Students circle their specific terminal count outcomes across three distinct trials on



their individual recording matrices.

13. Low Friction Analysis:
The class reviews why the smooth exterior of Seed B causes it to slide off the cotton fibers almost instantly, lacking any physical appendages to generate friction.
14. Internal Animal Vector Extension: The teacher explains that smooth, appetizing seeds use an internal mechanism, relying on sweet fruit pulp to entice birds to swallow them and transport them inside their digestive tracts.
15. Overcrowding Resource Synthesis: The lesson closes with a visual thought experiment showing fifty oak saplings attempting to grow directly underneath a parent tree canopy, demonstrating that seed dispersal is essential to prevent severe resource competition for water, sunlight, and soil space.

Differentiation:

- Pre-cut adhesive foam tape circles are provided to replace liquid glue lines for student pairs experiencing sensory or fine-motor sensitivities.
- Visual sequence cards depicting the step-by-step assembly of the cotton cup model are anchored at eye level on individual student desks.
- Text-to-speech descriptions and enlarged illustrations are integrated into the data logging sheets to assist English language learners with trait vocabulary.
- Advanced students can introduce variant fiber test patches, utilizing wool yarn or smooth nylon strips to observe how changing the animal fur structure alters seed retention rates.



- Sentence starters are built into the closing discussion sheets: "Seed A stayed on the fur for more hops because its fuzzy structure was able to [blank] onto the soft cotton hairs."

Resources Provided:

- Mystery Science botanical video catalogs, micro-imagery of hook-and-loop fasteners, and wildlife trail logs.
- Mystery Pack (Plastic tracking cups, premium cotton fibers, texturized felt seed facsimiles, and smooth test beads).
- Individual student data matrices, master classroom tally boards, and high-tack construction adhesives.



Lesson Plan 3 Template

Content Area: Science Lesson Title: Why do you find flowers and bees together? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital classroom projection system to stream macro lens recordings of insects harvesting floral food reserves alongside high-contrast visual anatomical charts of varied angiosperm species, utilizing a synchronized digital timer to coordinate cross-pollination flight trials.

Equipment Needed: Student cardstock plant stems, liquid glue applicators, purple and orange coloring markers, high-tack adhesive labels, small plastic inverted cups, vibrant colored cornstarch powder blocks, and texturized wire pipe cleaners.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define pollination as the critical ecological function where reproductive powder is transferred from one blossom to another via a mobile animal vector. - Students will construct a functional multi-part floral model incorporating simulated nectar wells, pollen dust zones, and sticky stigma surfaces. - Students will manipulate texturized wire materials to craft a high-friction	Lesson Sequence - Phenomenon: A honeybee spends its afternoon flying between bright red poppies to drink sweet liquid, leaving each blossom with hundreds of microscopic yellow powder grains temporarily locked into its hair, which instantly detach the moment it encounters the center of a neighboring plant. - The Garden Partnership Hook: The teacher leads a brief discussion about	- Students will database their visual findings, documenting the presence of contrasting powder colors on their worksheet matrices to verify successful cross-pollination. - Students will verbally define pollination as the mechanical movement of pollen from one flower to the sticky center of another flower by a helpful animal. - Students will complete a structural analysis table,



insect model capable of catching and retaining external powder grains during simulated motion.

- Students will analyze physical cross-contamination outcomes, tracking how structural properties like stickiness and fuzziness govern the transfer of biological materials between locations.

sunny spring days, highlighting how bees and flowers appear together constantly in nature, much like common everyday pairs like shoes and socks.

3. The Long Tongue Reveal: The teacher displays close-up footage of an insect extending a slender, straw-like tongue deep into a blossom center to drink nectar, establishing that the insect is seeking food rather than just smelling the petals.
4. Nectar and Pollen Definition: The teacher defines the scientific terms nectar (a sweet liquid food produced by flowers) and pollen (the fine, powdery dust necessary for a plant to develop seeds) inline to establish the underlying biological resource loop.
5. The Stigma Trait Framework: The teacher introduces the term stigma inline (the sticky central part of a flower designed to catch passing pollen grains), explaining that a flower cannot produce healthy new seeds unless pollen from a separate plant lands directly on this sticky surface.
6. Floral Blueprint Coloring: Students work in collaborative

identifying how a bee's fuzzy exterior and a flower's sticky interior function together as a complementary system.

- Students will explain why an insect's quest for food is directly tied to a plant's ability to generate seeds and maintain future generations.



partnerships to color the foundational stem and leaf structures of their cardstock templates before anchoring the primary paper petal disc using liquid adhesive.

7. Anatomical Part
Mapping: Partners use markers to add a central purple nectar target ring surrounded by numerous orange radial lines representing the pollen-bearing stalks, mapping out the internal functional layout of a real blossom.
8. The Sticky Stigma
Fabrication: One partner wraps an adhesive label loosely around their thumb with the sticky adhesive side facing outward, pressing it down firmly into the exact center of the flower paper to create a functioning structural trap.
9. The Isolation Cup
Protocol: Students place a small plastic cup upside down directly over their new sticky stigma to shield it from premature contamination during the next assembly phase.
10. Pollen Accumulation
Run: Teams distribute two distinct colors of fine powder at their tables; each student sprinkles a large pinch of their chosen color around the



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- protective perimeter cup to create a localized pollen field.
11. The Fuzzy Bee Engineering Loop: Students manipulate a texturized wire pipe cleaner, rolling and wrapping the flexible material into a tight multi-layered bundle to simulate the high-friction, hairy body shell of a foraging insect.
 12. The Flight and Feeding Simulation: Students remove the protective isolation cups; partnerships simulate real-world cross-pollination by buzzing their fuzzy wire insect models down into their partner's flower to seek nectar before flying back to their own.
 13. Color Contamination Analysis: Students inspect their sticky central stigmas, observing that a foreign powder color has been deposited onto the tape, proving that the fuzzy insect body successfully acted as a transport vehicle.
 14. Structure and Function Synthesis: The teacher introduces alternative global pollinators like bats and hummingbirds, contrasting a bat's furry snout with a bird's elongated beak to show



- how completely different structures can perform the exact same ecological function.
15. The Seed Creation Summary Wrap-Up: The lesson closes with an exploration of diverse wild flowers, demonstrating that while stigma and pollen shapes vary wildly across different species, their underlying functions remain identical: utilizing powdery textures and sticky surfaces to ensure reproductive success.

Differentiation:

- Pre-looped double-sided tape circles are provided to replace thumb-wrapping steps for student pairs navigating tactile sensitivities or finger-coordination challenges.
- High-contrast visual boundary guides are printed onto the flower templates to assist students with spatial-tracking needs during powder deposition.
- Multilingual picture cards linking the terms "Nectar (Food)" and "Pollen (Seed Maker)" to explicit graphic symbols are anchored on the primary learning board.
- Advanced students can use their models to simulate a multi-flower garden chain, tracking how far a single powder color can travel across three sequential flower visits before running out.
- Sentence frames are integrated into the summary sheets: "The pollen from my partner's flower was carried to my flower by the [blank] body of the bee, where it stuck to the [blank] stigma."

Resources Provided:

- Mystery Science floral anatomy software, global pollinator tracking logs, and seed-development video animations.
- Mystery Pack (Cardstock flower templates, texturized pipe cleaners, high-tack adhesive strips, and non-toxic colored indicator powders).
- Individual observation sheets, desktop workspace setups, and shared color-coded material trays.



Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly*, *Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☒	☐	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☒	☐	☐
Integrate 21st century skills	☒	☐	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Science	Grade Level: 2	Unit Title: Plant Adventures
Created: 2026	Board Approved on: Type Here	



Unit Overview Template

Content Area: Science **Grade Level:** 2 **Unit Title:** Work of Water

Unit Summary: In this second-grade earth science and engineering design unit, students step into the roles of computational geologists, hydrologists, and civil design engineers to explore how the dynamic movement of water shapes, carves, and radically reconfigures the surface of our planet. Students begin by unraveling a historical geographic mystery: how a hidden treasure cache buried for forty years was recovered by matching old maps to the permanent, unchanging curve of a river bend. Through hands-on topographical mapping and kinetic paper-crumpling fluid simulations, students build three-dimensional models of real-world landscapes. They discover the foundational mechanics of watershed systems, tracing how gravitational forces compel rainwater to gather along high mountain ridges and flow through low valley channels down to the open ocean. Students then transition to direct environmental experimentation and physical modeling to investigate the origins of sand and the mechanics of earth transformations. By simulating high-velocity mountain flash floods and executing rhythmic, impact-based rock-tearing trials, they gather direct physical evidence of how massive solid boulders break down into progressively smaller sediment over time. They explore the varying speeds of geological change, contrasting the slow, continuous carving of deep river canyons over millions of years with the rapid, catastrophic destruction of severe flash floods and sudden mudslides. The unit culminates in a hands-on engineering design challenge where students synthesize their discoveries. Using their knowledge of earth materials and erosion control, students sketch, build, and optimize custom physical barriers and retaining walls using modeling clay and natural aggregates. Through this iterative process, they demonstrate that human engineering can design effective solutions to slow down water velocity, stabilize vulnerable slopes, and protect communities from hazardous earth events.

Primary Interdisciplinary Connections: Mathematics and ELA

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

Unit Rationale: Water is a constant presence in the daily lives of second-grade students, yet children frequently view the earth's landforms as permanent, immutable fixtures rather than dynamic, constantly changing structures shaped by the relentless work of water. This unit bridges that gap by anchoring fundamental concepts of geology, fluid dynamics, and hazard mitigation into highly interactive, physical simulations—such as crumpling paper watersheds, slamming river sediments, and failing soil slopes. Investigating water pathways shifts students from simply identifying landforms to analyzing the core physics of earth systems. By testing how variations in elevation—like steep mountain peaks, rolling hills, and flat open plains—interact with gravity and rainwater runoff, students realize that a landscape's physical architecture directly dictates where water will flow, collect, and erode. Furthermore, conducting controlled sediment trials moves students away from rote memorization of geographic definitions and into active, data-driven scientific inquiry where they must use concrete physical evidence to explain how mechanical friction creates the very sand found at our beaches. Concluding with a design challenge focused on severe weather and slope stability highlights the critical relationship between human civilization and earth systems. Students learn that civil



engineering must work in harmony with nature, utilizing patterns of cause and effect to solve complex structural problems in community safety and environmental conservation.

Career Readiness (Standard 9):

9.4.2.CT.3: Use a variety of types of thinking to solve problems.

9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.

9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.

9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.

Learning Targets

Standards: 2-ESS1; 2-ESS2, K-2-ETS1

Content Statements: Earth's Place in the Universe; Earth's Systems; Engineering Design

CPI#: **Cumulative Progress Indicator (CPI):**

2-ESS1-1	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
2-ESS2-1	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
2-ESS2-2	Develop a model to represent the shapes and kinds of land and bodies of water in an area.
2-ESS2-3	Obtain information to identify where water is found on Earth and that it can be solid or liquid.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
SL.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by linking their explicit comments to the remarks of others. C. Ask for clarification and further explanation as needed about the topics and texts under discussion.



2.M.A.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2.DL.A.1	Understand that people collect data to answer questions. Understand that data can vary.
SEL.PK-12.4.1	Develop, implement and model effective problem solving and critical thinking skills.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.2.3	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.
8.2.2.ITH.3	Identify how technology impacts or improves life.
8.2.2.ITH.4	Identify how various tools reduce work and improve daily tasks.
8.2.2.ITH.5	Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.
8.2.2.ETW.1	Classify products as resulting from nature or produced as a result of technology.
8.2.2.ETW.2	Identify the natural resources needed to create a product.
8.2.2.ETW.3	Describe or model the system used for recycling technology.
8.2.2.ETW.4	Explain how the disposal of or reusing a product affects the local and global environment.
8.2.2.EC.1	Identify and compare technology used in different schools, communities, regions, and parts of the world.

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2- ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a model to represent patterns in the natural world. (2- ESS2-2)
- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)



Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations from several sources to construct an evidence based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth

- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

ESS2.A: Earth Materials and Systems

- Wind and water can change the shape of the land. (2-ESS2-1)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes

- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)



ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions, such as climate change, to other people. (K-2-ETS1-2), (K-2-ETS1-3)

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (secondary to 2-ESS2-1)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3)

Stability and Change

- Things may change slowly or rapidly. (2-ESS1-1), (2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World

- Scientists study the natural and material world. (2-ESS2-1)

Unit Essential Questions:

- How do the physical shapes, profiles, and elevations of landforms determine the path and speed of flowing water?
- What are the natural forces that break down massive solid rocks into fine sediment and transport them across vast geographic areas?
- How can human engineers design and optimize physical structures to slow down water erosion and protect communities from rapid, dangerous earth events like flash floods and landslides?

Unit Enduring Understandings:

- Water naturally shapes and maps the land, collecting along high mountain ridges and flowing downhill through low valleys to gather in the lowest points on Earth, which are the oceans.
- Rivers act as powerful geological conveyor belts, generating mechanical friction that continuously breaks heavy rocks into tiny sand grains and carries them across massive distances.
- Earth events can happen at vastly different speeds; some changes occur slowly over millions of years, while severe weather events like flash floods can radically reshape a landscape in minutes, requiring strategic engineering solutions to protect human habitats.

Unit Learning Targets:

Students will....



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- Design, construct, and analyze a three-dimensional topographic paper model to demonstrate how gravitational forces compel surface water to flow downhill from high ridges to low plains.
- Execute a multi-stage physical simulation using paper boulders to model and chart how continuous mechanical impact changes large rocks into progressively smaller sediment.
- Measure, record, and map geographic variables across a grid matrix using a compass rose to isolate specific locations based on intersecting land and water boundaries.
- Engineer, draw, and optimize a custom physical barrier system using modeling clay and gravel to successfully slow down water runoff and prevent structural erosion on a simulated hill slope.



Evidence of Learning

Summative Assessment: Unit Assessment

Equipment Needed: Mystery Science Kit

Teacher: Mystery Science Online Program

Resources:

Formative Assessments:

- The Grid Coordinate Navigation Log: A performance-based testing checkpoint where students log precise paths and identify hidden landmarks using fixed cardinal headings (North, South, East, West) across a geographic matrix.
- The Watershed Runoff Trajectory Analysis: A data-tracking task where students monitor and trace the movement of dissolved water-soluble ink, validating that fluid channels form exclusively within structural valley folds.
- The Sediment Size Gradient Sheet: A mathematical sketching document where student pairs record and draw the physical scale reduction of travelling rock fragments from high mountain headwaters down to coastal beaches.
- The Slope Stability Engineering Blueprint: An engineering design evaluation where students produce technical drawings and physical models of a retaining wall, proving its capacity to maintain soil foundation stability across multiple simulated rainfall events.



Lesson Plans

Lesson	Time Frame
Lesson 1 Where's the best place to hide a treasure?	2 days
Lesson 2 If you floated down a river, where would you end up?	2 days
Lesson 3 Why is there sand at the beach?	2 days

Teacher Notes:

This unit requires careful management of timing, moisture, and materials, as it transitions between active liquid testing, fast-paced physical simulations, and structural engineering trials. Prepare a dedicated material distribution station and waterproof workspace covers well in advance to accommodate the water-spraying and modeling clay activities without damaging desk surfaces or student journals.

When executing the kinetic paper-tearing river loops and the mist-spray watershed trials, prepare for an energetic, movement-heavy classroom environment. Establish a clear, quiet auditory callback signal—such as a rhythmic rain-stick pattern or a non-verbal "fists up, waters calm" posture—to instantly freeze student movement and smoothly transition teams back into independent data entry or collaborative group discussion. During the engineering and design phases, consistently prompt students to look past aesthetic features and focus heavily on mechanics. Push them to explain the exact physics of their erosion barriers, describing why a certain shape deflects fluid momentum or how a specific material composition creates higher friction to slow down water velocity and fulfill its protective function.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:
mysteryscience.com



Lesson Plan 1 Template

Content Area: Science	Lesson Title: Where's the best place to hide a treasure?	Time Frame: 2 days
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Lesson Components

21st Century Themes

- | | |
|--|---|
| ☒ Global Awareness | ☐ Financial, Economic, Business and Entrepreneurial Literacy |
| ☒ Civic Literacy | ☒ Health Literacy |

21st Century Skills

- | | | |
|---|---|--|
| ☒ Creativity and Innovation | ☒ Critical Thinking and Problem Solving | ☒ Information Literacy |
| ☒ Life and Career Skills | ☒ Communication and Collaboration | ☒ Media Literacy ☐ ICT Literacy |

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to broadcast aerial satellite topographical photography alongside historical urban landscape matrices, utilizing an interactive compass overlay system to track coordinates across a grid-based spatial mapping interface.

Equipment Needed: Large printed grid-based landscape map boundaries, dual-toned landscape marker sets, child-safe blunt scissors, high-tack adhesive sticks, custom die-cut geographic feature inserts (mountains, hills, islands), and individual tracking coordinate log sheets.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define a map as a scaled down, bird's-eye model of a real-world geographic location that represents physical features of land and water. - Students will identify and differentiate between distinct landforms and water bodies based on their structural shapes, profiles, and flow characteristics. - Students will execute directional movements across a grid system using a compass rose to	Lesson Sequence - Phenomenon: A family in Boston successfully uncovers a bronze treasure chest buried forty years prior beneath a shifting urban landscape by using a historical map to anchor their search to the permanent, unchanging curve of a nearby river. - The Boston Burial Hook: The teacher shares the true story of the Boston treasure hunt, explaining how a family located a prize hidden for forty years in a changing park	- Students will successfully complete their geographic grid models, gluing all nine land and water features into their correct cardinal locations based on text clues. - Students will verbally define an island as a piece of land that has water wrapped all the way around its perimeter. - Students will track and write down a multi-step navigation path on their worksheets using the cardinal directions North, South, East, and West.



orient paths toward fixed cardinal headings (North, South, East, West).

- Students will synthesize multiple spatial clues to isolate a specific coordinate point on a matrix, evaluating how intersecting geographic boundaries mark a static location.

by tracking its position relative to a permanent river.

3. The Bird's-Eye Perspective Shift: The teacher models how a map functions as a superhero-style view from above, simplifying a complex real-world space into a manageable, scaled structural model.
4. The Compass Rose Initiation: The teacher introduces the term compass rose inline (a directional star drawn on a map to indicate the permanent directions of North, South, East, and West), demonstrating that unlike "left" and "right," cardinal directions remain completely stable regardless of which way a traveler faces.
5. Feature Sorting Protocol: Students work in collaborative pairs to cut out nine distinct geographic map pieces, sorting them into two functional categories: land features and water features based on shape attributes.
6. The Lake Definition Synthesis: The teacher defines the term lake inline (a large, wide body of calm, still water completely surrounded by land on all sides) to help students identify the

- Students will identify at least three distinct structural differences that separate a mountain range from a rolling system of hills.



- first missing piece from a text-based riddle.
7. The Hill Matrix
Alignment: Students track one square East from their city starting point on their personal map grids, aligning and gluing down the rounded, knuckle-shaped hill piece onto the template.
 8. The Mountain Elevation
Contrast: The teacher contrasts the rolling, gentle profile of hills with mountains, highlighting their sharp, towering rocky peaks and seasonal snowcaps to guide students in selecting the next structural landform.
 9. The River and Snake
Analogy: Students decipher a clue describing a rapidly moving water feature that curves side-to-side across the landscape like a snake, identifying it as a river before gluing it down south of the mountains.
 10. The Waterfall Cliff Drop:
Teams identify a waterfall by listening to an audio cue of roaring thunder, placing the descending water feature directly where the river system intersects a steep elevation cliff.
 11. The Isolated Island
Boundary: The teacher defines the term island inline (a distinct piece of



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land completely surrounded by water on all sides), instructing students to track to the far western edge of their map to position the final missing landform in the ocean.

12. **Intersecting Triangulation Hunt:** Students analyze the mapmaker's final compound clue, searching for the single coordinate square that simultaneously features mountains to its North, a waterfall to its East, and an island to its West.
13. **X Marks the Spot Execution:** Partners verify their spatial coordinate intersection and draw a bold "X" on their maps to mark the exact location of the hidden cache, confirming their find against the class master board.
14. **The Permanent Feature Analysis:** The teacher displays historical imagery of Athens and Shanghai, showing students that while skyscrapers and buildings change rapidly over a century, fundamental land and water features like rivers and hills remain remarkably stable.
15. **Local Topography Extension:** The lesson concludes with a visual



- showcase of diverse regional features like flat-topped mesas, low-dipping valleys, deep canyons, and open plains, prompting students to evaluate which local landform would make the ultimate hiding spot.
16. ICT Literacy - Digital Satellite Exploration: Students use digital satellite mapping software (like Google Earth) to toggle between real-world aerial imagery and grid overlays, using digital zoom and layer tools to analyze how physical landforms and river boundaries appear from space compared to flat paper maps.
17. Financial & Business Literacy - Asset Location Cost Analysis: Students analyze the economic impact of the recovered treasure mystery by calculating the basic costs of the recovery operation (tools, search time, and navigation equipment) versus the final financial value of the recovered property assets.
18. Economic & Entrepreneurial Literacy - Land Use Planning: Working as entrepreneurial land developers, students evaluate their grid maps to determine the most financially sound and



	safe locations to build a hypothetical local business, avoiding high-risk water boundaries to protect their financial investment from potential flooding.	
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Differentiation:

- Pre-cut geographic feature inserts are provided to replace fine-motor scissor tasks for student pairs navigating manual dexterity challenges.
- High-contrast color-coded boundary rings (green for land, blue for water) are integrated onto the grid squares to assist students with spatial tracking and visual processing needs.
- Large-print directional arrow cards (N, S, E, W) are temporarily taped directly onto the edges of student desks to provide an immediate physical reference for cardinal alignment.
- Advanced students can author their own multi-step directional riddles, using coordinate movements to lead a partner to a second hidden target on their completed map.
- Sentence frames are embedded into the tracking sheets: "To find the treasure from the city, I must first travel [blank] toward the lake, and then turn [blank] toward the mountains."

Resources Provided:

- Mystery Science global cartography media suite, satellite terrain imagery files, and urban architectural timeline photography.
- Mystery Pack (Grid-mapped terrain templates, printable geographic feature sheets, and directional navigation journals).
- Individual desktop compass guides, shared adhesive distribution trays, and single-unit metric graphing matrices.



Lesson Plan 2 Template

Content Area: Science Lesson Title: If you floated down a river, where would you end up? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital display system to broadcast satellite tracking maps of continental drainage basins alongside slow-motion topographic fluid simulation models, utilizing an interactive classroom web interface to trace river pathways from mountain headwaters to coastal oceans.

Equipment Needed: Heavyweight white construction paper, large waterproof plastic workspace sheets, high-saturation water-soluble markers, fine-mist water spray bottles, clear plastic collection trays, and student observation data logs.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define a river as a natural, continuous channel of freshwater that flows downhill from high elevation zones to low elevation zones. - Students will construct a three-dimensional topographic landscape model by crumpling and texturing sheets of paper to create high peaks and low plains.	Lesson Sequence - Phenomenon: A plastic bottle dropped into a quiet woodland stream immediately begins drifting away in a continuous line without any assistance from the wind, eventually tracking across multiple interconnected waterways until it reaches the open ocean thousands of miles away. - The Drifting Bottle Hook: The teacher tells a story	- Students will successfully complete their crumpled terrain models, accurately tracing how fluid channels formed along the low valleys rather than remaining on the high ridge lines. - Students will verbally explain that rivers always flow from high places (mountains/hills) down to low places (oceans). - Students will use their observation data logs to



- Students will execute a controlled fluid trial to demonstrate how gravity forces surface water to collect along structural creases and valley depressions.
- Students will analyze flow patterns on a map interface to identify global geographic rules governing where rivers begin and end.

- about exploring a forest stream for tadpoles, where a dropped plastic bottle begins floating away in a steady line, revealing that the water is constantly moving in a single direction.
3. Flowing vs. Wavy Water: The teacher contrasts the crashing, back-and-forth motion of ocean waves with the continuous, one-way path of a river, defining the term flow inline (to move steadily and continuously in a current or stream).
 4. Continental Map Cross-Examination: The teacher projects a flat map of North America showing major river tracks, prompting students to look for patterns regarding where the pathways start and where they finish.
 5. The Ocean Destination Pattern: The class analyzes major channels like the Mississippi River, discovering that all major rivers share a common ending point: they empty out into the vast, salty waters of the ocean.
 6. The Flat Map Dilemma: The teacher points out that looking at a flat map makes river starting points seem completely random, explaining that the real world has structural changes in

- trace and describe how a drop of rain falling on a mountain eventually travels into a local stream and a major river system.
- Students will identify the ocean as the primary ending point for the planet's major freshwater river systems.



- height that a smooth piece of paper hides.
7. **The Paper Landscape Construction:** Working in pairs, one student creates a sturdy base with their fist while the partner crumples two stacked sheets of paper over it to generate a texturized, wrinkled surface.
 8. **Topographical Feature Assessment:** Students carefully unfold their paper sheets and anchor the corners onto a plastic-covered desk, observing how the crinkles form high ridges, sloped hills, and flat open plains.
 9. **High-Point Elevation Mapping:** Partners collaborate to find the highest folds on their paper models, drawing thick, heavy lines along these ridges using water-soluble markers to highlight the highest elevations.
 10. **Ink Saturation Protocol:** Students trace over their ridge lines multiple times to deposit a heavy layer of ink, preparing the model so the ink can act as a colored tracking indicator when moisture is added.
 11. **Simulated Rain Shower Trial:** Students use a fine-mist spray bottle to give their models five uniform squirts of water, pausing for one full



- minute before applying a second round of five sprays to simulate consecutive rain showers.
12. Gravitational Runoff
Analysis: Teams watch the colored water move on their models, noting how the liquid dissolves the ink and flows out of the high paper ridges, down through the creased valleys, and into the lowest flat areas.
13. Mountain Headwater
Synthesis: The teacher adds topographic mountain ranges (like the Rockies and Appalachians) to the continental map, revealing that real-world rivers always start at high elevation points like hills and mountains.
14. Stream and Tributary
Integration: The teacher explains that small streams and creeks start in high zones and merge together to feed into larger channels, acting like a network of branching paths that carry water down to the sea.
15. Global Gravity
Connection: The lesson closes with an exploration of gravity's role in shaping water pathways, proving that rivers flow simply because water falls on high land and must



always travel downhill to the lowest points on Earth, which are the oceans.

Differentiation:

- Pre-crumpled textured cardstock sheets are provided to replace heavy hand-squeezing steps for students navigating motor-strength or joint sensitivities.
- Bright neon tracking markers are substituted for standard shades to assist students with visual tracking delays as the ink begins to dissolve and flow.
- Picture-based sequence cards illustrating the "Spray, Wait, Watch" routine are affixed to the table workspace to support task focus and self-direction.
- Advanced students can add small structural blockades (like modeling clay dams) into their paper valleys to observe how blocking a channel forces a river to change its path.
- Sentence starters are integrated into the final log sheets: "The colored water moved away from the high [blank] lines because gravity pushed it down into the low [blank]."

Resources Provided:

- Mystery Science geographic tracking media, continental drainage grid layouts, and fluid dynamic video loops.
- Mystery Pack (Heavyweight model paper sheets, high-saturation water-soluble tracking markers, and waterproof workspace shields).
- Precision misting bottles, single-unit topographic plotting paper, and individual watershed tracking logs.



Lesson Plan 3 Template

Content Area: Science Lesson Title: Why is there sand at the beach? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to present microscopic magnification arrays of varying sediment grains alongside high-speed kinetic water impact simulations, utilizing interactive geographic tracking maps to overlay continental mountain headwaters with coastal beach coordinates.

Equipment Needed: Five-page sequential river track sheets, large sorting paper layout bins, kid-safe tearing paper blocks (simulated boulders), desktop mechanical timers, magnifying view lenses, and student data sketching sheets.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define sand as miniature, weathered fragments of real rock that match the mineral colors of their upstream mountain source. - Students will describe erosion inline (the natural process where water, wind, or ice moves rocks and soil from one location to another) as the physical force that transports materials downhill. - Students will execute a multi-stage physical simulation to model how continuous mechanical	Lesson Sequence - Phenomenon: At Pfeiffer Beach in California, the ocean shoreline is covered in vibrant purple sand that matches the color of specific rocks found miles away in high mountain ranges, rather than the grey cliffs directly bordering the coast. - The Purple Sand Paradox: The teacher introduces Pfeiffer Beach in California, showing students that while most beaches feature tan sand, this specific location is covered in purple sand	- Students will successfully finalize their tracking sheets, displaying a clear visual gradient from large upstream boulders down to tiny beach grains. - Students will verbally explain that sand is made of tiny rocks that got broken up during a long trip down a river. - Students will define erosion as the process where moving water picks up and carries rocks away to a new home. - Students will correctly match a series of colored sand samples to their



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impact changes large boulders into progressively smaller pieces.

- Students will analyze a structural model to explain the relationship between river water velocity and the physical size of traveling sediment.

that does not match the local coastal cliffs.

3. Microscopic Texture Inspection: The teacher presents a magnified view of sand under a microscope, demonstrating to students that beach sand is actually composed of millions of tiny, independent pieces of rock.
4. Upstream Mountain Detection: The teacher explains that the matching purple source rocks are located miles away in high, steep mountains, presenting a mechanical mystery of how large rocks move down to the sea.
5. Velocity and Impact Assessment: The teacher connects back to river systems, explaining that steep mountain headwaters move incredibly fast, giving the current enough mechanical energy to push and roll heavy rocks.
6. River Team Formation: Students organize themselves into collaborative teams of four, with each team functioning as an entire active river system split across five sequential tracking pages.
7. Boulder Breakdown Initiation: Teams align

matching color-coded mountain source rocks on a diagnostic worksheet.



pages one through five in numerical order, placing large sheets of paper representing massive mountain boulders onto page one.

8. The Flash Flood Trial:
When the teacher triggers a five-second timer, students rapidly grab the paper boulders, rip them cleanly in half, and pass the fragmented pieces down to the sloped river page.
9. Rocky Slope Mechanical Friction: The teacher restarts the five-second countdown, prompting students on page two to tear the incoming pieces in half again, simulating how rocks slam together as they slide down a mountain.
10. Pebble Thinning
Progression: The rapid tearing process continues onto pages three and four, converting the fragmented pieces into small gravel pieces and fine river pebbles as the current flows toward the plains.
11. Coastal Shatter
Execution: On the final page representing the ocean beach, the team works together during a final five-second burst to rip the paper pieces as small as physically possible to simulate crashing ocean waves.



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12. Geometric Data Charting:
Students receive a mapping log to draw the physical scale of the rocks across the river pathway, visually capturing how size decreases as distance from the source increases.
13. The Erosion Principle
Formulation: The teacher defines the word erosion inline (the moving and carrying away of rocks and soil by natural forces like fast water), explaining that rivers act like a conveyor belt to carry material.
14. Global Color Variance
Extension: The class reviews photographs of rainbow-colored mountains in Argentina and multi-toned sand in Australia, discovering that a beach's color profile depends directly on the minerals in the upstream mountains.
15. Channel Endpoint
Review: The lesson concludes with students evaluating local maps to find where nearby rivers meet the ocean shore, proving that wherever a sandy beach exists, a river system is typically nearby dumping sediment.

Differentiation:

- Perforated or pre-creased paper strips are provided to substitute for thick-gauge paper sheets for student pairs working through fine-motor coordination needs.



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- High-contrast boundary mats are placed under each of the five river pages to provide clear visual targets during rapid passing sequences.
- Visual symbol prompt cards showing a single giant boulder changing into multiple tiny dots are placed at each table to anchor the concept of structural reduction.
- Advanced students can calculate and chart the estimated multiplication of pieces after each round of tearing, documenting how a single rock splits into dozens of pieces.
- Sentence frames are embedded into the drawing sheets: "The rocks are biggest at the [blank] because they haven't crashed yet, and smallest at the [blank] because the water smashed them."

Resources Provided:

- Mystery Science sediment tracking media, magnification image sets, and international coastal terrain files.
- Mystery Pack (Five-stage river grid maps, standard boulder sheets, and particle sketching journals).
- High-intensity desktop magnifying lenses, shared sorting trays, and baseline metric particle counters.



Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☒	☐	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☒	☐	☐
Integrate 21st century skills	☒	☐	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Science	Grade Level: 2	Unit Title: Work of Water
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Created: 2026	Board Approved on: Type Here
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Unit Overview Template

Content Area: Science **Grade Level:** 2 **Unit Title:** Material Magic

Unit Summary: In this second-grade physical science and engineering design unit, students step into the roles of materials scientists, structural technicians, and manufacturing design engineers to explore how the observable properties of matter dictate the real-world utility and structural capabilities of human designs. Students begin by immersing themselves in an island survival scenario: surviving an emergency shipwreck with nothing but swimsuits and the contents of a washed-up lunchbox. Through hands-on physical testing, students evaluate the unique traits of everyday items. They discover the foundational mechanics of matter, testing how properties like absorbency, stiffness, opacity, and flexibility determine whether a material can successfully protect a human body from intense solar radiation. Students then transition to thermal and structural experimentation, planning and conducting standard comparative tests to classify diverse substances based on their reactions to environmental forces. They investigate how heat travels through materials, discovering why metal cooking pans transfer energy instantly while stone and polymers act as thermal barriers. Moving from thermal energy to structural mechanics, students explore how objects made of a small set of pieces can be disassembled and reconstructed into completely new structures with entirely different characteristics, turning floppy card arrays into load-bearing columns. The unit culminates in a geo-structural engineering challenge centered on soil mechanics. Using their cumulative knowledge of material properties, students mix, test, and analyze the specific ratios of sand, clay, and water needed to create structural mud bricks. Through this iterative design process, they demonstrate that the structural integrity of human infrastructure depends entirely on selecting and optimizing the correct physical properties of raw natural resources.

Primary Interdisciplinary Connections: Mathematics and ELA

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

Unit Rationale: Everyday objects and building structures are a constant presence in the daily lives of second-grade students, yet children frequently view items by their functional names—like bag, cup, or dirt—rather than identifying them as complex materials with specific, testable physical properties. This unit bridges that gap by anchoring fundamental concepts of chemistry, thermodynamics, and civil engineering into highly interactive, physical simulations—such as water-dripping absorbency tests, blind sensory insulation trials, index card load-bearing modifications, and mud aggregate mixture ratios. Investigating material traits shifts students from simply utilizing objects to analyzing form and function. By testing how variations in structural traits—such as rigid paper plate brims, conductive aluminum sheets, insulating Styrofoam barriers, or binding clay aggregates—interact with forces and energy, students realize that an object's physical architecture directly dictates its performance success. Furthermore, conducting controlled physical stress tests moves students away from rote memorization of definitions and into active, data-driven scientific inquiry where they must use concrete physical evidence to defend their material choices. Concluding with a design challenge focused on mud infrastructure highlights the deep relationship between human civilization and



earth materials. Students learn that modern construction relies on identifying and mixing materials with predictable physical patterns to solve complex structural problems in community housing, commerce, and environmental engineering.

Career Readiness (Standard 9):

9.4.2.CT.3: Use a variety of types of thinking to solve problems.

9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.

9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.

9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.

Learning Targets

Standards: 2-PS1, K-2-ETS1

Content Statements: Matter and Its Interactions; Engineering Design

CPI#:	Cumulative Progress Indicator (CPI):
2-PS1-1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
2-PS1-2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
2-PS1-3	Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
K-2-ETS1-3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
SL.2.1	Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups. A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). B. Build on others' talk in conversations by linking their explicit comments to the remarks of others. C. Ask for clarification and further explanation as needed about the topics and texts under discussion.



2.M.A.1	Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2.DL.A.1	Understand that people collect data to answer questions. Understand that data can vary.
SEL.PK-12.4.1	Develop, implement and model effective problem solving and critical thinking skills.
SEL.PK-12.2.2	Recognize the skills needed to establish and achieve personal and educational goals.
SEL.PK-12.2.3	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.
8.2.2.ITH.3	Identify how technology impacts or improves life.
8.2.2.ITH.4	Identify how various tools reduce work and improve daily tasks.
8.2.2.ITH.5	Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.
8.2.2.ETW.1	Classify products as resulting from nature or produced as a result of technology.
8.2.2.ETW.2	Identify the natural resources needed to create a product.
8.2.2.ETW.3	Describe or model the system used for recycling technology.
8.2.2.ETW.4	Explain how the disposal of or reusing a product affects the local and global environment.
8.2.2.EC.1	Identify and compare technology used in different schools, communities, regions, and parts of the world.

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2- ETS1-1)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

**Developing and Using Models**

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2), (K-2-ETS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3)

Disciplinary Core Ideas**PS1.A: Structure and Properties of Matter**

- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2), (2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions, such as climate change, to other people. (K-2-ETS1-2)

ETS1.C: Optimizing the Design Solution



- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter

- Objects may break into smaller pieces and be put together into larger pieces or change shapes. (2-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Unit Essential Questions:

- How do the physical properties and internal traits of a material determine what it can be used to make?
- In what ways can a small set of simple pieces be disassembled and rearranged to create an object with completely different structural properties?
- How can engineers mix and optimize natural earth materials to design stable, permanent structures for human communities?

Unit Enduring Understandings:

- Every material has distinct, observable properties—such as flexibility, hardness, absorbency, conductivity, and opacity—that make it uniquely suited for specific practical uses.
- A single set of component pieces can be taken apart and reorganized into a completely new configuration, changing the overall shape, function, and stability of the engineered object.
- The strength and durability of a building material depends on the exact mixture of its raw ingredients, requiring engineers to test and analyze different aggregate ratios to prevent structural failure.

Unit Learning Targets:

Students will....

- Design, construct, and evaluate a physical prototype of a protective hat to analyze how material variations block solar radiation and manage moisture.
- Plan and conduct collaborative physical investigations to classify materials as thermal insulators or thermal conductors based on their ability to resist or permit heat transfer.



- Construct, measure, and disassemble a modular structural tower using flexible elements to demonstrate how geometric alterations create load-bearing capacity.
- Formulate, test, and compare diverse mud aggregate ratios to determine which mixture of sand, clay, and water yields the highest structural stability for masonry construction.



Evidence of Learning

Summative Assessment: Unit Assessment

Equipment Needed: Mystery Science Kit

Teacher Mystery Science Online Program

Resources:

Formative Assessments:

- The Property Diagnostic Ledger: A performance-based testing checkpoint where students log, categorize, and rank the softness, absorbency, and stiffness profiles of everyday survival packaging.
- The Blind Sensory Thermal Matrix: A data-tracking task where student pairs record and map the heat transfer rates of metals, fabrics, and plastics to isolate conductive pathways versus insulating barriers.
- The Load-Bearing Structural Blueprint: An engineering design evaluation where students complete technical sketches and height logs of a reconfigured index card tower supporting a standardized weight load.
- The Mud Brick Mass Settlement Log: A comparative data sheet where student teams record the settling behavior, crack resistance, and weight limits of varied soil-to-water aggregate mixtures.



Lesson Plans

Lesson	Time Frame
Lesson 1 Why do we wear clothes?	2 days
Lesson 2 Can you really fry an egg on a hot sidewalk?	2 days
Lesson 3 Could you build a house out of paper?	2 days

Teacher Notes:

This unit requires careful management of timing, cleanup, and materials, as it transitions between dry tactile testing, water-dripping trials, thermal simulations, and damp mud manipulation. Prepare a dedicated raw aggregate mixing station and heavy-duty workspace covers well in advance of the final lesson to accommodate the muddy material trials without disrupting standard desk spaces. When executing the kinetic card-folding tasks and the sensory water bottle testing loops, prepare for an energetic, movement-heavy classroom environment. Establish a clear, quiet auditory callback signal—such as a rhythmic wooden block pattern or a non-verbal "hands up, tools flat" posture—to instantly freeze student movement and smoothly transition teams back into independent data entry or collaborative group analysis. During the engineering and construction phases, consistently prompt students to look past aesthetic features and focus heavily on mechanics. Push them to explain the exact physics of their designs, describing why a certain geometric fold prevents collapse or how a specific ratio of sand to clay increases the hardness of a structural brick to fulfill its industrial building function.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:
mysteryscience.com



Lesson Plan 1 Template

Content Area: Science Lesson Title: Why do we wear clothes? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to present macro-magnified images of fabric weaves alongside slow-motion video captures of fluid droplets hitting porous versus non-porous barriers, utilizing interactive property tracking matrices to log material performance data.

Equipment Needed: Paper plates, brown paper bags, plastic spoons, water distribution cups, un-textured cardstock sheets, standard scissors, low-tack adhesive tape, and student property testing worksheets.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define physical properties inline (the specific traits or characteristics of a material) as the observable features that make a substance useful for a job. - Students will describe absorbency inline (the capacity of a material to soak up wetness or liquid) as the physical property required to manage sweat. - Students will execute a multi-stage physical simulation to test and	Lesson Sequence - Phenomenon: After surviving a tropical shipwreck with nothing but swimsuits, students must use washed-up lunchbox items like paper plates and brown bags to engineer a functional hat that blocks blinding desert sunlight and absorbs sweat. - The Swimsuit Island Hook: The teacher introduces the shipwreck scenario, challenging students to imagine being stranded on a hot tropical island for a week with	- Students will successfully finalize their property testing sheets, correctly classifying paper plates as stiff/non-absorbent and paper bags as soft/absorbent based on empirical data. - Students will verbally explain that clothing materials are chosen based on their physical properties rather than what they look like. - Students will define a physical property as an observable trait or characteristic that



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classify everyday items based on their softness, absorbency, and stiffness.

- Students will analyze a structural design to explain how combining different material properties solves an environmental survival challenge.

nothing but a swimsuit to spark a discussion on the protective purposes of clothing.

3. Weather and Fabric Trait Analysis: The teacher presents video clips of raincoats and winter coats, demonstrating that different weather conditions require clothing made of materials with specific traits, such as waterproof plastic or heat-trapping wool.
4. The Desert Robe Paradox: The teacher displays an image of a long cotton robe worn in the hot desert, explaining how properties like opacity (blocking sunlight to prevent sunburn) and absorbency make it highly functional.
5. Armor Material Contrast: The teacher introduces a suit of steel metal armor to show that comfort isn't always the primary goal of clothing, highlighting properties like hardness and strength compared to total weight.
6. Hat Mechanics Assessment: The teacher reviews three hot-weather hats (cowboy hat, pioneer bonnet, loose cloth), establishing that a successful sun hat needs a stiff brim to cast a shadow and a soft,

determines how an object can be used.

- Students will correctly match a series of apparel descriptions to their ideal material compositions on a diagnostic exit ticket.



- absorbent crown for the head.
7. Lunchbox Material Transition: The teacher introduces the engineering challenge, instructing students to look past the commercial names of washed-up supplies (paper plates, paper bags) and view them strictly as raw materials with testable properties.
 8. Design Team Formation: Students organize themselves into collaborative engineering partnerships, gathering their testing kits and leveling their workspace protection mats.
 9. The Softness Tactile Trial: Partners rub each material sample against their skin, recording their data on their worksheets to evaluate which material possesses the comfort required to touch a wearer's head all day.
 10. The Sweat-Soaker Drip Test: Using a plastic spoon, students drop uniform amounts of water onto the paper plate and paper bag samples, monitoring whether the fluid pools on top or soaks in to identify absorbent materials.
 11. The Brim Stiffness Evaluation: Students hold each material



sample horizontally in the air to see if it stands rigid or droops downward under gravity, determining which asset is stiff enough to keep a brim out of a wearer's eyes.

12. Prototype Design

Assembly: Using their logged data, each student constructs their own custom hat, slicing the stiff paper plates to form an extended brim and shaping the soft paper bags to create the head covering.

13. The Sun-Blocking

Verification: Students test their completed prototypes under classroom light sources, verifying that their structural brims successfully project a protective shadow over their faces.

14. Property Defense

Showcase: The lesson concludes with student volunteers modeling their designs and answering targeted reflection questions, explicitly linking their material choices to the physical properties verified during the testing lab.

Differentiation:

- Pre-cut or pre-scored paper plate templates are provided to substitute for standard plates for student pairs working through fine-motor coordination needs.
- High-contrast cutting boundary guidelines are pre-drawn onto the materials to provide clear visual targets during rapid assembly sequences.



- Visual symbol prompt cards showing step-by-step icons for the softness, absorbency, and stiffness trials are placed at each table to anchor task sequencing.
- Advanced students can introduce a third material variable (such as thin tissue paper), calculating how to incorporate its flexibility without compromising the hat's sun-blocking opacity.
- Sentence frames are embedded into the drawing sheets: "I selected the paper plate for the brim because it has the property of being [blank], which keeps it from flopping, and the bag for the top because it is [blank]."

Resources Provided:

- Mystery Science clothing utility media, material property magnification graphics, and historical hat reference logs.
- Mystery Pack (Paper plates, brown paper bags, plastic testing spoons, and hat blueprint journals).
- Uniform water distribution cups, shared assembly tools, and baseline property assessment grids.



Lesson Plan 2 Template

Content Area: Science Lesson Title: Can you really fry an egg on a hot sidewalk? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to present thermal imaging maps of high-temperature cooking surfaces alongside slow-motion video captures of thermal transfer through metallic lattices versus cellular polymers, using an interactive digital database to track student material insulation metrics.

Equipment Needed: Aluminum foil sheets, standard fabric socks, clean Styrofoam cups, sealed plastic water bottles filled with hot water, sealed plastic water bottles filled with cold water, classroom mechanical timers, and student thermal property worksheets.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define insulating inline (the physical property of a material that blocks or resists the movement of heat) as the primary characteristic needed to protect skin from burning forces. - Students will describe conducting inline (the physical property of a material that allows heat to move through it quickly and easily) as the	Lesson Sequence - Phenomenon: An egg cracked onto a sun-heated desert island rock or a blazing 134-degree Death Valley road remains completely raw, yet cracking that same egg into a metal frying pan left out under identical conditions cooks the egg within minutes. - The Desert Island Breakfast Quest: The teacher continues the survival scenario,	- Students will successfully finalize their thermal tracking sheets, correctly organizing foil as a conductor and foam/cloth as insulators based on empirical sensory data. - Students will verbally explain that metal frying pans cook food quickly because metals possess high thermal conductivity. - Students will define insulation as a property



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vital mechanism for transfer of energy to food.

- Students will execute a multi-stage physical simulation to test, measure, and classify unknown objects as thermal barriers or thermal pathways.
- Students will analyze a structural model to explain how contrasting thermal properties determine the optimal commercial selection of cooking tools versus safety wear.

explaining that the stranded class found chicken eggs but cannot cook them on the island rocks because the eggs remain raw despite the intense solar heat.

3. The Death Valley Road Mystery: The class examines environmental data from Death Valley showing that surface temperatures reach 134 degrees, yet eggs cracked onto the asphalt pavement still fail to fry, creating a scientific mystery.
4. The Fire and Shrapnel Solution: The teacher explains that a classmate built a fire and salvaged a sharp piece of metal from the shipwreck to use as a makeshift pan, allowing the class to finally cook their food.
5. The Heat Handling Crisis: The teacher presents the new dilemma that the hot metal pan will burn human fingers if touched directly, prompting students to brainstorm how people handle blazing oven items back home.
6. Mitten Material Contrast: The teacher contrasts cloth fabric oven mitts and cardboard coffee sleeves, explaining that different materials can share the exact same

that stops heat from moving into a new space.

- Students will correctly sort a mixed array of safety apparel and cooking instruments into conductive or insulating categories on a diagnostic matching grid.



- hidden capability to resist thermal energy movement.
7. Safety Testing Protocols: The teacher introduces the material testing lab, instructing students to test alternative materials using safely heated bottles of water rather than actual burning metal pans to prevent real skin injuries.
 8. Research Partnership Alliances: Students assemble into collaborative research pairs, configure their tracking mats, and distribute the aluminum foil, fabric socks, and Styrofoam testing shells across their workstations.
 9. The Blind Foil Friction Trial: One partner covers their hand in an aluminum foil mitten, closes their eyes, and handles the hot and cold bottles to see if they can immediately identify the temperature difference.
 10. The Blind Sock and Foam Runs: The blindfolded testing process repeats using the fabric socks and the Styrofoam cup sleeves, with partners alternating roles to gather independent sensory observations for every single material sample.
 11. The Insulation Ledger Recording: Students



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- populate their tracking charts by marking which materials successfully blocked the thermal sensation completely, partially permitted the heat, or transferred the thermal force immediately.
12. The Sidewalk Frying Revelation: The teacher projects a video clip of a metal pan frying an egg on a road, explaining that metals make terrible hand protectors but perfect cooking pans because they permit heat passage.
13. The Rock Insulation Distinction: The teacher defines rock as an insulator that traps energy inside its top layer, explaining that the egg on the desert island rock failed to cook because the rock refused to pass the heat along.
14. Local Thermal Utility Mapping: The lesson concludes with students auditing the classroom to identify everyday tools made of contrasting conductive and insulating parts, proving that industrial manufacturers combine properties to keep humans safe.

Differentiation:

- Pre-folded aluminum foil pockets are provided to substitute for raw sheets for student pairs working through fine-motor manipulation needs.



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- High-visibility color rings are applied to the hot and cold water containers to provide clear visual cues during rapid sorting sequences.
- Visual symbol prompt cards displaying a red fire symbol blocked by a thick wall are positioned at each station to anchor the concept of insulation.
- Advanced students can stack multiple layers of fabric socks, recording and charting how structural thickness alters the rate of heat sensation.
- Sentence frames are embedded into the data logs: I used the Styrofoam cup for my hand because it has the property of being [blank], which keeps the hot pan from [blank] my skin.

Resources Provided:

- Mystery Science thermal transformation media, molecular movement animation diagrams, and desert terrain temperature charts.
- Mystery Pack (Pre-cut foil sheets, clean testing socks, raw insulating foam cylinders, and particle temperature logs).
- Uniform water warming elements, digital tracking monitors, and baseline temperature boundary grids.



Lesson Plan 3 Template

Content Area: Science Lesson Title: Could you build a house out of paper? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital visual display system to present structural engineering diagrams of corrugated cardboard cross-sections alongside slow-motion weight-bearing stress analysis clips, using a synchronized digital classroom matrix to graph and compare individual tower height and load capacity data.

Equipment Needed: Standard unlined index cards, metal paperclips, standard classroom rulers, hardcover testing textbooks, student tower design worksheets, and desktop workspace layout templates.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define flexibility inline (the physical property of a material that allows it to easily bend, fold, or deform without breaking) as a trait that can be altered through geometric reshaping. - Students will describe structural stability inline (the capacity of an engineered shape to maintain its form and support external weight under load forces) as a	Lesson Sequence - Phenomenon: Floppy, flexible index cards that droop instantly under gravity can be structurally modified by folding, rolling, or zigzagging to construct a rigid, six-inch tower capable of supporting a heavy hardcover textbook. - The Building Skeleton Overview: The teacher presents images of active construction sites, prompting students to	- Students will successfully finalize their tower prototypes, proving that their note card structure can remain standing under the physical load of a hardcover book for at least ten seconds. - Students will verbally explain that folding a flexible material changes its shape to make it stiffer and stronger. - Students will define structural stability as the capacity of an object to



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product of intentional design.

- Students will execute a multi-stage physical simulation to transform flimsy paper elements into rigid columns using folds, cuts, and rolls.
- Students will analyze a structural model to explain how combining small, weak pieces can create a larger, highly functional civil engineering asset.

analyze the structural frames of skyscrapers and houses made of wood, brick, steel, and concrete to identify the shared property of strength.

3. Alternative Aggregate Structures: The class evaluates photographs of the House of Bottles in Argentina and a life-sized plastic LEGO house, establishing that tiny, independent pieces can be combined systematically to form massive structures.
4. The Flimsy Paper Dilemma: The teacher drops a standard sheet of paper to demonstrate its flexibility and easy crumpling habits, prompting students to debate whether such a flimsy material could ever be used to create real architectural spaces.
5. Origami and Aerodynamics Contrast: The teacher presents folded paper birds and stiff paper airplane wings, demonstrating to students that the physical traits of a weak substance can be altered through intentional geometric shapes.
6. Engineering Team Assembly: Students form collaborative design partnerships, clear their construction zones, and

stand firm and carry weight without collapsing.

- Students will correctly identify the internal zigzag architecture of corrugated boxes on a material analysis exit ticket.



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- distribute twenty note cards and a set of metal paperclips to each manufacturing pair.
7. Edge Balance
Exploration: Partners spend three minutes experimenting with a single index card, attempting to discover at least three distinct methods—such as creasing, bending, or cutting—to make the floppy card stand vertically without human hands.
 8. The Ruler-Height
Challenge: The teacher triggers a five-minute timer, challenging teams to combine their note cards and clips to build a tower that matches the exact physical height of a standard twelve-inch classroom ruler.
 9. Gallery Walk Ideation:
Teams pause their building to observe adjacent workstations, analyzing peer structural configurations to borrow successful folding or interlocking layout patterns.
 10. The Structural Transition
Brief: Students complete mid-activity reflections in their journals, shifting their design focus from purely achieving vertical height to maximizing load-bearing stability.



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11. The Heavy Book Stress Test: Pairs reconstruct or modify their towers to meet a strict six-inch minimum height limit, carefully balancing a heavy hardcover textbook on top of the paper columns to test the structural boundaries of their designs.
12. Corrugated Cardboard Inspection: The teacher presents a magnified view of a cardboard box edge, revealing the zigzag layer trapped between two flat planes that gives paper packaging its stiff capability.
13. Post-Disaster Architecture Review: The lesson concludes with a review of temporary emergency housing built out of cardboard tubes after natural earthquakes, proving that affordable paper materials can become structural lifesavers when altered by clever engineering.

Differentiation:

- Pre-scored index cards featuring guided fold paths are provided to substitute for raw cards for student pairs navigating fine-motor manipulation needs.
- High-contrast physical alignment grids are taped to the tabletops to provide a stable, symmetrical visual base for tower construction.
- Visual prompt cards illustrating three foundational support folds (the cylinder roll, the triangle prism, and the zigzag accordion) are displayed at every station.
- Advanced students can limit their materials, attempting to pass the textbook stress test using only ten note cards instead of twenty to maximize structural load efficiency.



- Sentence frames are embedded into the data sheets: I changed the properties of the flat card by [blank] it into a new shape, which made the final tower much more [blank] under the heavy book.

Resources Provided:

- Mystery Science structural design media, architectural skeleton animation loops, and disaster relief housing case studies.
- Mystery Pack (Heavyweight construction index cards, steel fastener clips, and structural measurement logs).
- Individual test textbooks, precision alignment rules, and desktop assembly boards.



Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☒	☐	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☒	☐	☐
Integrate 21st century skills	☒	☐	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Science	Grade Level: 2	Unit Title: Material Magic
Created: 2026	Board Approved on:	Type Here



Unit Overview Template

Content Area: Science **Grade Level:** 2 **Unit Title:** States of Matter

Unit Summary: Welcome to States of Matter. In this second-grade physical and earth science unit, students step into the roles of climatologists, thermal analysts, and manufacturing design engineers to explore how temperature fluctuations dictate the physical states of matter and shape both global ecosystems and human industries. Students begin by embarking on a virtual field expedition to the freezing Arctic wilderness. Through interactive wildlife tracking and structural journaling, they map out the distribution of Earth's water resources. They discover the foundational relationship between temperature and states of matter, tracing how aquatic mammals, pinnipeds, and apex predators depend simultaneously on liquid ocean waves, solid pack ice shelves, and dense snow drifts to hunt, rest, and build protective nurseries. Students then transition to direct thermodynamic laboratory experimentation, participating in a series of controlled material tournaments to evaluate how diverse substances respond to extreme thermal shifts. By subjecting food items, art media, and sweet confections to rapid heat rings and cold chill zones, they gather empirical sensory evidence to differentiate between temporary phase changes and permanent chemical reactions. They explore the boundaries of material malleability, analyzing how the property of being meltable allows solid materials to be poured into custom molds to create complex, everyday shapes. The unit culminates in a comprehensive material suitability analysis where students synthesize their discoveries. By charting how different solids deform or hold their shape under high-temperature conditions, they construct evidence-based arguments to explain why industrial toy manufacturers abandoned wood in favor of highly adaptable, meltable, and moldable polymers to mass-produce modern infrastructure and consumer goods.

Primary Interdisciplinary Connections: Mathematics and ELA

21st Century Themes ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

Unit Rationale: Water and solid materials are deeply integrated into the daily experiences of second-grade students, yet young children frequently view states of matter as permanent, unrelated categories rather than dynamic, interchangeable phases controlled by temperature energy. This unit bridges that gap by anchoring fundamental concepts of phase transitions, thermal permanence, and industrial molding into highly interactive, physical simulations—such as folding Arctic climate journals, tracking tournament brackets in the Ultimate Undo Showdown, and testing candy candy deformation inside high-heat water baths. Investigating phase changes shifts students from simply labeling objects to analyzing the core physics of thermal energy and molecular states. By tracking how variations in ambient temperature interact with different types of matter—such as melting ice sculptures, solidifying wax crayons, hardening pancake batter, or melting raw polymers—students realize that a substance's atomic stability directly dictates its real-world performance. Furthermore, conducting systematic heating and cooling trials moves students away from superficial observations and into active, data-driven scientific inquiry where they must use concrete physical evidence to justify the selection of reversible or irreversible materials. Concluding with an investigation into the invention of plastic and shipping logistics highlights the



critical relationship between chemistry, manufacturing, and human civilization. Students learn that modern commercial production relies on discovering predictable material properties and exploiting patterns of cause and effect to generate efficient, affordable, and durable solutions for global communities.

Career Readiness (Standard 9):

9.4.2.CT.3: Use a variety of types of thinking to solve problems.

9.4.2.DC.6: Identify respectful and responsible ways to communicate in digital environments.

9.4.2.TL.1: Identify the basic features of a digital tool and explain the purpose of the tool.

9.4.2.TL.7: Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts.

9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.

Learning Targets

Standards: 2-ESS2, 2-PS1

Content Statements: Earth's Systems; Matter and Its Interactions

CPI#: **Cumulative Progress Indicator (CPI):**

2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

2-PS1-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

SL.2.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
A. Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
B. Build on others' talk in conversations by linking their explicit comments to the remarks of others.
C. Ask for clarification and further explanation as needed about the topics and texts under discussion.

2.M.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.DL.A.1 Understand that people collect data to answer questions. Understand that data can vary.

SEL.PK-12.4.1 Develop, implement and model effective problem solving and critical thinking skills.

SEL.PK-12.2.2 Recognize the skills needed to establish and achieve personal and educational goals.



SEL.PK-12. 2.3	Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals.
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Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Different properties are suited to different purposes. (2-PS1-2)

PS1.B: Chemical Reactions

- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed. (2-ESS2-3)

Cause and Effect

- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

Unit Essential Questions:

- Where is water found on Earth, and how do its different physical states create distinct habitats for living things?
- What determines whether a material's physical transformation under heat is a temporary, reversible phase or a permanent, irreversible change?
- How do industrial engineers utilize the melting points and states of matter of different materials to mass-produce everyday objects like toys and candy?

Unit Enduring Understandings:

- Water exists across Earth's surface in multiple environments and shifts between liquid and solid states depending on the localized temperature of the habitat.



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- Temperature fluctuations trigger physical changes in matter; some substances undergo reversible changes that return them to their original traits, while others undergo irreversible transformations that alter their properties forever.
- Identifying whether a material is meltable and knowing its exact temperature threshold allows humans to shape liquid matter using molds to manufacture durable, cost-effective consumer products.

Unit Learning Targets:

Students will....

- Map, record, and evaluate Arctic wildlife behaviors to identify where liquid water and solid ice collect across Earth's surface processes.
- Plan and conduct collaborative laboratory investigations to classify everyday food and art supplies into reversible or irreversible change categories following thermal exposure.
- Analyze empirical data arrays from candy immersion tests to determine which confection properties are best suited to survive high-temperature transportation systems.
- Construct an evidence-based scientific argument to explain how the invention of meltable plastic revolutionized global toy manufacturing by replacing hand-carved wood structures.



Evidence of Learning

Summative Assessment: Unit Assessment

Equipment Needed: Mystery Science Kit

Teacher Mystery Science Online Program

Resources:

Formative Assessments:

- The Arctic Water Distribution Journal: A performance-based environmental log where students categorize global habitats and correlate marine animal survival actions with liquid or solid water states.
- The Ultimate Undo Tournament Bracket: A data-tracking matrix where student pairs document initial, heated, and chilled material properties to isolate reversible phase pathways from irreversible chemical bakes.
- The Confectionery Thermal Deformation Ledger: An engineering design ledger where students measure, squish, and log candy structural stability scores following a simulated high-temperature mail truck transit.
- The Polymer Suitability Argumentation Blueprint: A written and verbal scientific evaluation where students use historical manufacturing data to justify the selection of molded plastic over carved wood for mass production.



Lesson Plans

Lesson	Time Frame
Lesson 1 Where do animals find the water they need?	2 days
Lesson 2 How is an ice cube like a crayon?	2 days
Lesson 3 Why are so many toys made out of plastic?	2 days

Teacher Notes:

This unit requires precise management of heat sources, timing, and containment, as it transitions between paper tracking, dry tactile trials, hot water immersion setups, and damp, melting food materials. Prepare a dedicated hot water distribution center and heavy-duty, lip-edged spill trays well in advance of the lessons to safely manage the thermal testing cups without risking skin burns or compromising student desktop journals. When executing the blind sensory tracking trials and the candy immersion squeeze tests, prepare for an energetic, tactile-heavy classroom environment. Establish a clear, quiet auditory callback signal—such as a rhythmic wooden block strike pattern or a non-verbal "hands high, materials dry" posture—to instantly freeze student movement and smoothly transition teams back into independent data entry or collaborative group tournament debates. During the engineering and classification phases, consistently prompt students to look past commercial brand names and focus heavily on material mechanics. Push them to explain the exact thermodynamics of their samples, describing why a certain wax structure returns to a solid stick or how a specific batter mixture changes its internal bonds permanently to fulfill its industrial culinary or structural function.

Curriculum Development Resources/Technology Resources:

Click the links below to access additional resources used to design this unit:
mysteryscience.com



Lesson Plan 1 Template

Content Area: Science Lesson Title: Where do animals find the water they need? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital video projection system to display macro-imaging loops of crystalline snowflake geometries alongside synchronized geographic satellite tracking maps that overlay winter ice shelf expansion coordinates with marine mammal migration paths.

Equipment Needed: Student water journal worksheets, desktop habitat maps, standard rulers, blue multi-shade coloring pencils, mechanical tracking timers, and physical layout mats.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define states of water inline (the physical forms that water takes on Earth, including liquid water and solid ice or snow) as an environmental variable that dictates habitat availability. - Students will describe a body of water inline (a specific place on Earth's surface where a large volume of water naturally collects in one spot) as a foundational ecosystem resource. - Students will execute a multi-stage physical	Lesson Sequence - Phenomenon: In the freezing Arctic, humpback whales and orcas hunt deep beneath liquid ocean waves, while neighboring seals use floating platforms of solid ice to rest, and polar bears dig deep into packed snowbanks to build cozy nurseries for their cubs. - The Body of Water Introduction: The teacher introduces the concept of a body of water, listing familiar liquid examples	- Students will successfully finalize their Arctic water journals, correctly classifying every tracking station as a liquid, solid, or mixed water environment based on observational data. - Students will verbally explain that some Arctic animals require solid ice and snow surfaces to rest and build protective shelters. - Students will define states of water as the physical forms—liquid or solid—that water exhibits depending on the



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simulation to track, categorize, and log how different Arctic animals utilize solid and liquid water states for survival.

- Students will analyze an ecosystem model to explain how melting or freezing patterns alter the survival success of specialized animal species.

like neighborhood parks, local streams, massive regional lakes, rushing rivers, and vast global oceans.

3. The Winter Transformation Shift: The class evaluates winter landscape photographs, observing how a liquid body of water can freeze over into a solid surface to introduce the concept of changing states of matter.
4. The State of Matter Distinction: The teacher defines liquid water as a fluid state that slips through fingers and fills shapes, while defining ice and snow as solid forms of water that maintain a rigid structure when held.
5. Snowflake Composition Review: The teacher projects highly magnified microscopic views of individual snowflakes, demonstrating to students that snow is composed of millions of tiny, independent pieces of solid water ice.
6. Arctic Exploration Briefing: The teacher presents the Arctic field trip scenario, explaining that despite the extreme cold, this water-dominant ecosystem is packed with specialized wildlife that depends on multiple states of water.

surrounding temperature.

- Students will correctly match a series of animal survival behaviors to their required state of water on a diagnostic habitat evaluation chart.



7. Journal Engineering
Phase: Students organize themselves into collaborative research partnerships, flip their paper worksheets, and carefully align corners to fold and crease their multi-page Arctic water journals.
8. Liquid Ocean Wave
Analysis: The teacher plays video footage of the first Arctic tracking station, prompting student pairs to analyze the active waves and circle liquid water on their station logs.
9. Marine Mammal
Tracking: Students observe humpback whales and orcas, logging physical observations of how these animals use the liquid state of water to swim, leap, travel, and hunt for food assets.
10. Solid Ice Shelf
Observation: The lesson shifts to the second tracking station, where student teams identify large fields of floating solid ice sheets drifting over the liquid marine waves.
11. Pinniped and Apex
Predator Auditing:
Partners track seals resting on top of the solid pack ice to escape aquatic predators, while observing hunting polar bears walking across the



- rigid surface to cross geographic zones.
12. The Hidden Snow Drift Trial: At the final tracking location, students investigate deep snow drifts, identifying snow as a solid state of water before tracking a small ermine tunneling through the white powder.
13. Melt Hazard Evaluation: The class reviews data animations illustrating what happens when regional temperatures rise, modeling how solid ice platforms melt back into liquid water and strip away seal resting areas and polar bear den sites.
14. Human Infrastructure Connection: The lesson concludes with students comparing Arctic wildlife needs to human water dependencies, discovering that whether water is liquid for farming or frozen across school roads, changing states of water directly transform daily life.

Differentiation:

- Pre-folded tracking journals are provided to substitute for manual paper folding steps for student pairs working through fine-motor coordination needs.
- High-contrast color borders are placed around each section of the journal to provide clear visual targets during rapid page transitions.
- Visual symbol prompt cards displaying a blue water droplet next to a white ice cube are placed at each table to anchor the concept of changing states.
- Advanced students can use their rulers to measure and chart the simulated thickness changes of seasonal ice sheets, documenting how a loss of solid surface area impacts tracking distances.



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- Sentence frames are embedded into the tracking logs: The whales need the water to stay in a [blank] state so they can swim, while the polar bears need [blank] water to walk across the ocean.

Resources Provided:

- Mystery Science Arctic habitat media, microscopic snowflake image sets, and polar climate tracking loops.
- Mystery Pack (Foldable Arctic tracking journals, local habitat coordinate maps, and animal behavior reference sheets).
- Desktop layout mats, precision mapping rulers, and dual-color tracking markers.



Lesson Plan 2 Template

Content Area: Science Lesson Title: How is an ice cube like a crayon? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital video projection system to display macro-level molecular lattice diagrams of state phase transformations alongside high-definition time-lapse captures of industrial bronze castings and clay kiln firings, utilizing an interactive classroom voting matrix to track student predictions throughout the temperature experiment brackets.

Equipment Needed: Student showdown observation sheets, shared desktop materials trays, multi-colored wax crayons, modeling clay portions, liquid egg samples, solid butter cubes, high-density heat insulation test cups, ice water chill basins, and student data pencil kits.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define reversible change inline (a transformation in a material caused by heating or cooling that can be undone to return the substance to its original starting properties) as a core feature of phase shifts. - Students will describe irreversible change inline (a permanent transformation in a material caused by extreme temperature shifts that alters	Lesson Sequence Phenomenon: An epic ice sculpture left out under a hot sun melts entirely into a flowy puddle of liquid water, but that exact same water can be recaptured in a mold and frozen back into a hard solid sculpture, whereas a raw egg heated in a frying pan solidifies into a firm white structure that can never be turned back into a runny liquid no matter how long it sits in a freezer.	- Students will successfully finalize their showdown tournament brackets, correctly identifying butter, crayon, and chocolate as reversible materials and egg, clay, and batter as irreversible materials based on empirical data. - Students will verbally explain that an ice cube and a wax crayon are similar because both can melt into liquids and freeze back into hard



properties forever and cannot be undone) as a structural chemical adjustment.

- Students will execute a multi-stage physical simulation to test, log, and classify food and art supplies based on their structural reactions to thermal fluctuations.
- Students will analyze a material matrix model to explain how industrial manufacturers select reversible or irreversible substances to build consumer products.

2. The Ice Art Exposition: The teacher projects images of life-sized ice elephants and diving mermaids carved with chainsaws at the World Ice Art Championships in Alaska, highlighting that ice is a hard, rigid material that holds complex shapes.
3. The Texas Sun Melt Disaster: The class discusses what happens when a colossal ice dragon sculpture is moved outdoors into hot Texas weather, tracking its physical transformation from a hard solid structure into an epic flowy puddle.
4. The Liquid State Assessment: The teacher defines liquid water properties like flowiness and container conformity, contrasting them with solid water properties like hardness and fixed shape stability.
5. The Ultimate Undo Revelation: The teacher demonstrates how liquid water can be re-poured into a star-shaped tray and frozen back into a solid ice star, introducing the concept of an undo feature inherent to specific types of matter.
6. Bracket Tournament Configuration: The teacher announces the Ultimate Undo

solids when temperatures fluctuate.

- Students will define an irreversible change as a property shift that cannot be undone by cooling or heating.
- Students will correctly isolate reversible home events from irreversible culinary actions on a diagnostic situational sorting matrix.



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Showdown tournament, instructing students to evaluate whether other everyday materials possess the power to reverse their state changes or remain altered forever.

7. Research Partnership
Activation: Students align into collaborative testing teams, organize their workspace tracking matrices, and establish separate hot ring simulation cups and cold chill zone water basins.
8. The Breakfast Brawl
Inception: Teams log initial properties for raw egg and solid butter, noting that egg is a thick, drippy fluid while butter is a sliceable, squishy solid cube.
9. The Hot Ring Evaluation:
The teacher triggers a video showing the items subjected to intense heat, prompting students to observe how the egg solidifies into an opaque white disk while the butter liquefies into a golden pourable fluid.
10. The Chill Zone
Resolution: Teams observe both items after they enter the cold environment, noting that the liquid butter returns to a firm solid while the cooked egg refuses to uncook, crowning butter



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- the first reversible champion.
11. The Art Supply Standoff:
The tournament continues with match two, comparing a rigid wax crayon stick against a bendy lump of sculpting clay as they enter a specialized high-heat furnace ring.
 12. The Permanent Hardening Discovery:
Students track the results of the art supply trial, observing that the melted crayon solidifies back into a hard wax tool, while the fired clay bakes into a rock-hard masonry piece that can never become squishy again.
 13. The Power to Stay Formulation: The teacher defines irreversible changes using the cooked egg and hardened brick clay, explaining that permanent property transformation is highly useful for building enduring human infrastructure.
 14. The Sugary Showdown
Extension: The lesson concludes with a bonus challenge matching solid chocolate squares against liquid pancake batter, with students charting how the chocolate uses reversible states to survive the chill zone while the batter hardens



permanently into a
breakfast pastry.

Differentiation:

- Pre-marked sorting logs featuring high-contrast colored checkboxes are provided to substitute for extensive manual writing for student pairs navigating fine-motor processing needs.
- Desktop testing mats feature color-coded halos (red for hot ring, blue for chill zone) to provide clear spatial targets during rapid observation cycles.
- Visual symbol cards showing a two-way looping arrow next to a one-way straight arrow are displayed at each table to anchor the distinction between reversible and irreversible pathways.
- Advanced students can predict and chart the behavior of more complex combined materials, such as a marshmallow over a campfire, analyzing how its outer sugar crust changes irreversibly while its inner core melts reversibly.
- Sentence frames are embedded into the showdown logs: The heated crayon can undergo a [blank] change because cooling it makes it a hard solid again, but the hot pancake batter is [blank] because cold cannot turn it back into a runny liquid.

Resources Provided:

- Mystery Science tournament media assets, molecular structure phase shift diagrams, and industrial kiln firing documentation files.
- Mystery Pack (Breakfast Brawl data logs, Art Supply Standoff testing charts, Sugary Showdown bonus matrix sheets, and material property descriptor stickers).
- Thermal insulation workspace modules, shared aggregate containers, and tactile sorting indicator pegs.



Lesson Plan 3 Template

Content Area: Science Lesson Title: Why are so many toys made out of plastic? Time Frame: 2 days

Lesson Components

21st Century Themes

- ☒ Global Awareness ☐ Financial, Economic, Business and Entrepreneurial Literacy
☒ Civic Literacy ☒ Health Literacy

21st Century Skills

- ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ Information Literacy
☒ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy ☐ ICT Literacy

Interdisciplinary Connections: ELA and Mathematics

Integration of Technology: A digital video projection system to display slow-motion manufacturing footage of high-pressure liquid plastic injection molding machines alongside synchronized temperature data charts tracking the specific thermal melting points of modern polymers compared to natural wax and chocolate structures.

Equipment Needed: Student candy shipping worksheets, sealed candy test bags, wooden immersion push sticks, heavy-duty insulated water plates, hot water distribution containers, student observation markers, and desktop sorting grids.

Goals/Objectives	Learning Activities/ Instructional Strategies	Formative Assessment Tasks
Students will: - Students will define meltable inline (the physical property of a solid material that allows it to transform into a flowy liquid state when its temperature is raised to a specific heating point) as an industrial manufacturing asset. - Students will describe a mold inline (a hollow container or tray designed with a specific internal shape that forces liquid materials to take	Lesson Sequence Phenomenon: During the era of our great-great-grandparents, children owned only one or two expensive toys carved by hand from rigid blocks of wood, whereas modern department stores are filled with millions of affordable toys made of plastic that was heated into a flowy liquid, poured into intricate molds, and cooled back into durable solid shapes.	- Students will successfully finalize their candy shipping worksheets, correctly classifying their tested candies as solid, squishy, or liquid after hot water immersion based on direct physical evidence. - Students will verbally explain that toy companies use plastic instead of wood because liquid plastic can be poured into molds to



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on that exact configuration as they cool and solidify) as a tool for replication.

- Students will execute a multi-stage physical simulation to submerge, heat, and squeeze varied confectionery items to determine their suitability for transport through hot climates.
- Students will analyze a material property chart to explain how the melting thresholds of different solids dictate their practical use in consumer goods and toy production.

2. The Toy Material Audit: The teacher displays modern action figures, LEGO bricks, and doll assets, prompting students to identify that the vast majority of current childhood toys share the property of being made out of plastic.
3. The Historical Wood Dilemma: The class evaluates images of antique wooden horses and lions, discovering that before plastic was invented in 1856, toys were extremely rare and expensive because each piece had to be carved slowly by hand.
4. The Popsicle Replication Metaphor: The teacher introduces lion-shaped zoo popsicles to illustrate that instead of carving each individual ice figure, manufacturers pour liquid water into a specialized lion tray to quickly make identical copies.
5. The Liquid Conformity Rule: The class observes water filling the corners of an ice tray, confirming that liquids always take the exact shape of whatever container holds them before freezing into structured solids.
6. The Plastic Invention Discovery: The teacher tells the story of Alexander Parks

make millions of cheap toys very quickly.

- Students will define the property of being meltable as the capacity of a solid object to change into a flowable liquid when heated.
- Students will correctly identify which everyday materials will melt or remain solid when exposed to a warm environment on a manufacturing materials exit ticket.



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- accidentally mixing chemicals to create plastic, highlighting that this new material mimics ice by being meltable but requires a much higher temperature to liquefy.
7. The Camp Way Too Hot
Mission: The teacher presents a postcard from a friend stranded at a Florida summer camp who needs candy delivered via a mail truck that lacks air conditioning and drives through intense solar heat.
 8. Research Partnership
Initialization: Students assemble into engineering pairs, receive their specific designated candy varieties sealed inside watertight test bags, and fill out the initial predictions on their shipping ledgers.
 9. The Thermal Immersion Trial: The teacher distributes plates of hot water to each station, and students use wooden sticks to submerge their candy bags beneath the water surface for a timed two-minute heating cycle.
 10. The Shape Distortion Audit: Partners observe the candy through the clear plastic bags while still underwater, checking to see if the solid shapes have dissolved into liquid



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pools or maintained their molded borders.

11. Tactile Squish

Evaluation: Teams remove the heated bags from the water plate and carefully squeeze the candy with their fingers to log whether the substance remained completely solid, softened into a squishy paste, or melted entirely into a gooey liquid.

12. The Classroom Data

Compilation: The teacher builds a master matrix chart on the board, collecting results from every student group to map out which candy types possess the power to resist thermal melting forces.

13. The Shipping Solution

Selection: Students analyze the completed data matrix to select the ultimate melt-resistant candy to mail to Florida, proving that materials with high melting points are required to survive high-temperature transit.

14. Human Engineering

Connection: The lesson concludes with a review of other meltable materials like glass and metal, reinforcing that humans melt and mold solid matter to manufacture thousands of affordable everyday tools and toys.



Differentiation:

- Pre-labeled outcome cards with high-contrast colored checkmarks (Solid, Squishy, Melted) are provided to substitute for extensive text entry for student pairs managing fine-motor writing struggles.
- Desktop water plates feature raised high-visibility guide ridges to help student pairs safely center their immersion cups.
- Visual prompt cards displaying a melting candle flame next to a non-melting wooden block are positioned at every table to anchor the distinction between high and low thermal melting resistances.
- Advanced students can use classroom tracking rules to measure and calculate the fluid spread distance of melted chocolate across a grid matrix, evaluating how different fat content ratios alter liquid flow rates.
- Sentence frames are embedded into the candy analysis sheets: The chocolate bar is a bad choice for the mail truck because it is [blank] in the heat, but the hard candy is a good choice because its properties stay [blank] in the hot water.

Resources Provided:

- Mystery Science plastic molding history media, industrial factory simulation loops, and candy transport case studies.
- Mystery Pack (Watertight candy test bags, Florida camp shipping worksheets, master classroom data matrix posters, and thermal property descriptor labels).
- Hot water isolation trays, wooden push sticks, and desktop structural alignment grids.



Lesson Reflection

Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately* or *Weakly* meets the criteria below.

Lesson Activities	Strongly	Moderately	Weakly
Are challenging Strongly and require higher order thinking and problem solving skills	☒	☐	☐
Allow for student choice	☒	☐	☐
Provide scaffolding for acquiring targeted knowledge/skills	☒	☐	☐
Integrate global perspectives	☒	☐	☐
Integrate 21st century skills	☒	☐	☐
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills	☒	☐	☐
Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills	☒	☐	☐
Are varied to address different student learning styles and preferences	☒	☐	☐
Are differentiated based on student needs	☐	☒	☐
Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process	☒	☐	☐
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives	☒	☐	☐
Provide opportunities for student reflection and self- assessment	☒	☐	☐
Provide data to inform and adjust instruction to better meet the varying needs of learners	☐	☒	☐

Curriculum Design Template

Content Area: Science	Grade Level: 2	Unit Title: States of Matter
Created: 2026	Board Approved on:	Type Here



SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21st CENTURY
GLOBAL SKILLS

IEP AND 504 ACCOMMODATIONS AND MODIFICATIONS FOR EARLY CHILDHOOD AND ELEMENTARY SCHOOL STUDENTS:

Large print textbooks
Textbooks for at-home use
Additional time for assignments
Review of directions
Use of mnemonics
Have student restate information
Concrete examples
Adaptive writing utensils
Support auditory presentations with visuals
Use of a study carrel
Assistance in maintaining uncluttered space
Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
Space for movement or breaks
Study sheets and teacher outlines
Extra visual and verbal cues and prompts
Math sheets with highlighted instructions
Graph paper to assist in organizing or lining up math problems
Use of computers and calculators
Books on tape
Graphic organizers
Quiet corner or room to calm down and relax when anxious
Preferential seating
Alteration of the classroom arrangement
Reduction of distractions
Answers to be dictated
Hands-on activities
Use of manipulatives
No penalty for spelling errors or sloppy handwriting
Follow a routine/schedule
Alternate quiet and active time
Teach time management skills
Rest breaks
Verbal and visual cues regarding directions and staying on task
Agenda book and checklists
Adjusted assignment timelines
Visual daily schedule



SPRINGFIELD PUBLIC SCHOOLS

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS**

Varied reinforcement procedures
Immediate feedback
Work-in-progress check
Personalized examples

TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:

Answers to be dictated
Frequent rest breaks
Additional time
Oral testing
Untimed tests
Choice of test format (multiple-choice, essay, true-false)
Alternate ways to evaluate (projects or oral presentations instead of written tests)
Accept short answers
Open-book tests
Read test and directions to student
Provide study outline prior to tests
Highlight key directions
Test in alternative site
Use of calculator
Extra credit option
Preview test procedures
Simplified test wording; rephrased test questions and/or directions

GENERAL ACCOMMODATIONS AND MODIFICATIONS:

Use of alternative books or materials on the topic being studied
Computerized spell-check support
Word bank of choices for answers to test questions
Provision of calculator and/or number line for math tests
Reworded questions in simpler language
Projects instead of written reports
Highlighting important words or phrases in reading assignments
Modified workload or length of assignments/tests
Modified time demands
Modified grades based on IEP

BEHAVIOR ACCOMMODATIONS MODIFICATIONS:



SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS

Breaks between tasks
Cue expected behavior
Daily feedback to student
Have contingency plans
Use de-escalating strategies
Use positive reinforcement
Use proximity/touch control
Use peer supports and mentoring
Model expected behavior by adults
Have parent sign homework
Have parent sign behavior chart
Set and post class rules
Chart progress and maintain data



SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS

IEP AND 504 ACCOMODATIONS AND MODIFICATIONS FOR MIDDLE AND HIGH SCHOOL STUDENTS:

Large print textbooks
Textbooks for at-home use
Additional time for assignments
A locker with adapted lock
Review of directions
Review sessions
Use of mnemonics
Have student restate information
Provision of notes or outlines
Concrete examples
Adaptive writing utensils
Support auditory presentations with visuals
Weekly or bi-weekly home-school communication
Space for movement or breaks
Study sheets and teacher outlines
Extra visual and verbal cues and prompts
Lab and math sheets with highlighted instructions
Graph paper to assist in organizing or lining up math problems
Use of tape recorder for lectures
Use of Interactive notebook
Use of a scribe
Use of computers and calculators
Books on tape
Graphic organizers
Quiet corner or room to calm down and relax when anxious
Preferential seating
Alteration of the classroom arrangement
Reduction of distractions
Answers to be dictated
Hands-on activities
Ability to type all assignments
Follow a routine/schedule
Teach time management and organizational skills
Rest breaks
Verbal and visual cues regarding directions and staying on task
Agenda book and checklists
Daily check-in with case manager or special education teacher
Adjusted assignment timelines
Visual daily schedule



SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS

Varied reinforcement procedures
Immediate feedback
Work-in-progress check
Personalized examples

TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:

Answers to be dictated
Frequent rest breaks
Additional time
Oral testing
Choice of test format (multiple-choice, essay, true-false)
Alternate ways to evaluate (projects or oral presentations instead of written tests)
Accept short answers
Open-book or open-note tests
Read test and directions to student
Provide study guides prior to tests
Highlight key directions
Test in alternative site
Use of calculator
Extra credit option
Pace long-term projects
Preview test procedures
Simplified test wording; rephrased test questions and/or directions

GENERAL ACCOMMODATIONS AND MODIFICATIONS:

Allow outlining, instead of writing for an essay or major project
Use of alternative books or materials on the topic being studied
Computerized spell-check support
Word bank of choices for answers to test questions
Provision of calculator for math tests
Film or video supplements in place of reading text
Reworded questions in simpler language
Projects instead of written reports
Highlighting important words or phrases in reading assignments
Modified workload or length of assignments/tests
Modified time demands



SPRINGFIELD PUBLIC SCHOOLS

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY
GLOBAL SKILLS**

Pass/no pass option
Modified grades based on IEP

BEHAVIOR ACCOMMODATIONS FOR STUDENTS:

Breaks between tasks
Cue expected behavior
Daily feedback to student
Have contingency plans
Use de-escalating strategies
Use positive reinforcement
Use proximity/touch control
Use peer supports and mentoring
Model expected behavior by adults
Have parent sign homework
Set and post class rules
Chart progress and maintain data



Accommodations and Modifications for ESL Students

- Give tests orally
- Give instructions/directions in writing and orally
- Assign a peer tutor, same language or English speaking
- Allow use of bilingual/translation dictionary
- Provide summaries of text or study guides of particular chapters
- Allow errors in speaking
- Allow errors in writing
- Accept writing in first language
- Highlight key vocabulary
- Reduce amount of work required
- Assess comprehension through demonstration or other alternative means (gestures, drawings)
- Rephrase questions, directions, and explanations
- Reduce multiple choices on assessments
- Provide study guides and/ or outlines
- Shorten reading assignments
- Allow extended time for test/project completion
- Use of audio books
- Use of graphic organizers
- Use reduced text, so that print is not dense
- Use visuals/pictures throughout lesson/unit/assignment
- Adapt homework to reflect language proficiency/home support
- Adapt homework to reflect home support
- Provide hands-on activities and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Use of translation dictionaries to locate words in the native language
- Use anecdotal records and portfolio of work as forms of assessment
- Use story retellings to assess comprehension

What Does the Gifted and Talented Experience Look Like?
Springfield Public Schools

Mission Statement

The Gifted and Talented Program of the Springfield Public Schools aims to provide a meaningful and rigorous education that instills the value of lifelong learning and empowers all students to reach their full potential and become self-fulfilled creative leaders in accordance with the comprehensive standards of our state. We accomplish this by offering challenging, real-world experiences in a student-centered environment.

We recognize that students come from diverse socioeconomic, cultural, and ethnic backgrounds, and the mission of the gifted and talented program is to provide opportunities for students to explore their intellectual, creative, and artistic gifts and talents within the classroom and with beyond-the-classroom experiences. It is essential to provide diverse, appropriate, and ongoing learning experiences and environments that incorporate students' academic, psychological, and social needs. Our responsibility is to provide students with educational alternatives that teach, challenge, and expand their knowledge, while simultaneously stressing the development of independent and self-directed learners who continuously generate questions, analyze, synthesize, and evaluate information and ideas.

New Jersey Administrative Code 6A:8-3.1 defines students who are gifted and talented as those students who possess or demonstrate high levels of ability in one or more content areas when compared to their chronological peers in the local district and who require modification of their educational program if they are to achieve in accordance with their capabilities.

Goals:

To support our mission, we have established the following goals to guide our work:

- To infuse into the general education program a broad range of activities for high-level learning that will challenge all students to perform at advanced levels, and provide extended opportunities, resources, and support in particular areas where student interest or talent is demonstrated.
- To provide a continuum of gifted education services that will strengthen the total school program, offer enriching and challenging learning opportunities for all students, and provide specialized learning experiences
- To promote achievement of students' best potentials and increased ability.

Through a productive and collaborative relationship among the building principals, classroom teachers, and the Gifted and Talented teacher, our schools can create programming that will enhance the learning experience for every student and serve the unique and specialized needs of students currently demonstrating gifted behaviors.

Elements of the Schoolwide Enrichment Model, W.I.N (What I Need), differentiated instruction, advanced classes, or individual programs into a student's regular instruction program are integral to this overarching framework for gifted education in the Springfield School District.

Reference Board Policy and Regulation 2464 – Gifted and Talented Pupils (M)

Early Childhood Center **Edward V. Walton**

Schoolwide Virtual Enrichment

All first and second grade students have access to the [Gifted and Talented Virtual Classroom](#). This virtual classroom is a space for students to complete various challenges and enrichment opportunities at their own pace. Students can receive feedback and additional adaptable resources to meet their individual learning needs. The virtual classroom design expands accessibility to enrichment resources and allows students to choose learning activities according to their unique interests and abilities. The purpose of the activities is to encourage problem-solving, develop critical thinking

skills, and expand curiosity and imagination. Activities are aligned to the New Jersey Student Learning Standards.

Gifted and Talented Teacher as a Resource

The Gifted and Talented teacher serves as a resource to all teachers within Edward V. Walton School. Teachers seeking resources for their high-ability learners will receive additional support from the Gifted and Talented teacher in various ways. This support may include additional units of study, challenging resources, and student projects.

Elementary Schools

James Caldwell

Thelma L. Sandmeier

The goal is to engage small groups of students in intensive learning experiences through standards-based, rigorous, and relevant units of study that supplement, not supplant, the grade-level curriculum and support students' unique learning needs.

Enrichment Experience Grade 3

Beginning in third grade, the G&T teacher will cycle through all classrooms to work on problem-solving and enrichment tasks with students. Driven by assessment data, academic performance, student interest, and teacher observation, small groups of students will meet with the G&T teacher during W.I.N. (What I Need) periods throughout the week that the teacher is assigned to their classroom teacher. Groupings will be flexible and monitored to best meet each student's needs throughout the school year. Activities will include brain teasers, puzzles, strategic thinking, problem-solving, and STEM challenges.

Targeted Gifted and Talented Programing Grades 4-5

Students may become identified as Gifted and Talented in fourth grade. Students that are identified may receive support from the G&T Teacher for up to five periods (200 minutes) a week during W.I.N. (What I Need) periods. Identified students will meet to explore grade-level content while incorporating depth and complexity in a student-centered, problem-based environment. The Gifted and Talented Program aims to provide students with various advanced and challenging learning experiences across content areas to promote independent thinking skills, refine critical thinking and communication skills, cultivate joy in learning, and expand student interests through problem-solving. The instruction that students receive incorporates 21st Century Skills and advanced content that is challenging, hands-on, and relevant to the real world.

Strategies and Practices that Support Gifted and Talented Students

- Adjusted Pace of Lessons
- Inquiry-Based Instruction
- Higher-Order Thinking Activities
- Interest-Based Content
- Real World Problem Solving/Problem Based Learning
- Independent Study/Passion Projects
- Units of Study with Like-Minded Peers

Schoolwide Virtual Enrichment

All JCS and TLS students have access to grade level-specific [Gifted and Talented Virtual Classrooms](#). These virtual classrooms are a space for students to complete various challenges and enrichment opportunities at their own pace. Students are able to receive feedback and additional opportunities based on their needs. The virtual classrooms have expanded the accessibility of enrichment resources directly to the students and allows for students to choose opportunities according to their interests and abilities. The purpose of the activities is to encourage problem solving, develop critical thinking skills, and expand curiosity and imagination in conjunction with the New Jersey Student Learning Standards.

Gifted and Talented Teacher as a Resource

In addition to classroom support, the Gifted and Talented teacher also serves as a resource to all teachers in the building. Teachers that are seeking resources for their high ability learners will receive additional support from the Gifted and Talented teacher in various ways. This may include additional units of study, challenging resources, student projects, and meeting with the G&T teacher as needed.

Additional Enrichment Opportunities

Across all grade levels 3-5, as recommended by the classroom teacher, students exhibiting a need for additional enrichment may have the opportunity to meet with the G&T teacher as the schedule allows. Groupings will be flexible and monitored to best meet the students' needs throughout the school year. Activities will include, brain teasers, puzzles, strategic thinking activities, problem-solving challenges, and STEM challenges. Students engage in an extended process of asking questions, using resources, and developing answers that lead to thinking about what and how they are learning. Students are held accountable for how they work and use their time by demonstrating their learning through products or presentations.

Students self-select to participate in individual and/or group projects based on interest and commitment. The classroom teacher and/or the enrichment teacher will help guide and monitor student exploration of chosen topics, facilitating their learning with resources and teaching of needed skills.

Secondary Schools
Florence M. Gaudineer Middle School
Jonathan Dayton High School

Grades 6-12: Access to specific content programs with higher levels of academic challenges (i.e. Pre-Algebra, Accelerated Communication Arts, and Advanced Placement Classes)

Dual Credit Courses provide students the opportunity to obtain high school credit, and college credit, simultaneously through partnerships with several institutions.

Project Lead the Way (PLTW) students become builders of technology by engaging in real world activities. Students are empowered as design thinkers collaborating on real world projects.

Gifted and Talented Identification Criteria

The Springfield Schools Gifted and Talented Program recognizes that students require differentiated learning experiences beyond the core curriculum being taught because of their advanced abilities in one or more content areas. These students may also have other cognitive qualities such as curiosity, creativity, motivation, leadership, and passion that require modifications to their academic experience.

Multiple Measures of Eligibility

Kindergarten through grade twelve identification process for gifted and talented students includes multiple measures. Multiple measures may include but are not limited to: achievement test scores; grades; student performance or products; intelligence testing; parent, student, and/or teacher recommendation; and other appropriate measures. The identification methodology is developmentally appropriate, non-discriminatory, and related to the programs and services offered by the Springfield School District. The identification procedures are reviewed annually.

According to N.J.A.C. 6A:8-3.1, all public school districts must have a board-approved gifted and talented identification process and provide services for identified students enrolled in the grades of that school district. The regulations require that identification and services be made available to students in grades K-12.

When students are recommended for the Gifted and Talented Program there are multiple measures that are considered to determine if services are necessary and appropriate. The assessments used are as follows:

- Cognitive Abilities Test (CogAT)
- Classroom Performance/Student Portfolios
- DRA2 Level
- iReady Diagnostic Scores
- Gifted Indicators Checklist
- Start Strong/NJSLA Assessment Data

The N.J.A.C. requires that students be compared to their chronological peers in the local school district. The New Jersey Department of Education has not established state-level criteria for identifying students who are gifted, such as mandated tests or assessments, grade point averages, or IQ scores. Local school districts must use multiple measures to identify students.

Procedures

<https://www.straussesmay.com/seportal/Public/DistrictPolicy.aspx?policyid=2464&id=b8a33a9f505e4998a6db3fb8e1de778b>

Gifted and Talented Program Identification Matrix

Minimum Score Required for Consideration: 14 Points

1 Point	2 Points	3 Points
Cogat Assessment Overall Stanine Score of a 7	Cogat Assessment Overall Stanine Score of an 8	Cogat Assessment Overall Stanine Score of a 9
iReady Math Assessment Just Below Current Grade Level	iReady Math Assessment On Grade Level	iReady Math Assessment ½ Year + Above Current Level
iReady ELA On Grade Level	iReady ELA ½ Year Above Current Level	iReady ELA One Full Grade Level + Above Current Level
NJSLA Math Approaching Expectations	NJSLA Math Met Expectations	NJSLA Math Exceed Expectations
NJSLA ELA Approaching Expectations	NJSLA ELA Met Expectations	NJSLA ELA Exceed Expectations
HOPE Teacher Rating Scale Raw Score: 11 - 29	HOPE Teacher Rating Scale Raw Score: 30 - 49	HOPE Teacher Rating Scale Raw Score: 50-66

Team meetings present the opportunity to review data and assess the educational needs of all students. Teacher provides examples of student work exhibiting above and beyond grade level expectations, creativity, leadership, critical and abstract thinking. Programs for gifted and talented students will be periodically evaluated for their continuing efficacy and adjusted accordingly. The parent of any student identified as gifted or talented shall be consulted regarding any program designed to address the student's particular needs.

Resource Links

https://riversideinsights.com/cognitive_abilities_test

<https://www.curriculumassociates.com/programs/i-ready-learning>

<https://www.nj.gov/education/assessment/resources/>

<https://www.routledge.com/HOPE-Teacher-Rating-Scale-Involving-Teachers-in-Equitable-Identification/Gentry-Pereira-Peters-McIntosh-Fugate/p/book/9781618214522#:~:text=The%20HOPE%20Teacher%20Rating%20Scale,making%20it%20easy%20to%20use.>

Gifted and talented student: The "[*Strengthening Gifted and Talented Education Act*](#)" defines a gifted and talented student as a "student who possesses or demonstrates a high level of ability in one or more content areas when compared to their chronological peers in the school district and who require modifications of their educational program if they are to achieve in accordance with their capabilities."

Twice-exceptional (2E) students: A twice-exceptional (2E) student is defined as "a student who is both gifted and a student with a disability. These students may also be referred to as having dual exceptionalities or as being gifted with learning disabilities (GT/LD). This also applies to students who are gifted with ADHD or gifted with autism" (New Jersey Association for Gifted Children, www.nagc.org).

Instructional adaptation: An adjustment or modification to instruction enabling a student who is gifted and talented to participate in, benefit from, and demonstrate knowledge and application of the New Jersey Student Learning Standards in one or more content areas at the instructional level of the student, not just the student's grade level.

Identifying gifted and talented students: The focus of identification is to provide programming and services in which students' specific learning needs and potential are appropriately addressed and met. In every New Jersey school district, there are students who require modifications to the general education curriculum if they are to achieve in accordance with their abilities. By identifying a student's general intellectual ability, creativity, or specific academic area aptitudes, we are acknowledging that they need programming and services outside of the general education/grade level curriculum to advance their learning.

NJDOE Fast Facts

<https://www.nj.gov/education/standards/gifted/>

<https://www.nj.gov/education/standards/gifted/legislation.shtml>

Supplemental Resources/Programming for Gifted Students

Edward V. Walton

- PETS Program – Primary Education Thinking Skills
- Group Solutions/Group Solutions 2 – Cooperative Logic Activities
- Lollipop Logic
- Beginning Thinking Skills
- AIMS Education Programming

James Caldwell and Thelma L. Sandmeier

Math/ELA

- Project M3: Mentoring Mathematical Minds
- Junior Great Books
- AIMS Education Programming
- Borenson Hands on Equations
- BizWorld
- Perplexors
- Advanced Math Explorations grade 3-5
- Challenging Units for Gifted Learners (ELA and Math)
- Creative Curriculum Extenders
- Differentiated Lessons & Projects
- Challenge Math Grades 4+
- Differentiating Instruction with Menus (All Content Areas)
- Jacob's Ladder
- Genius Hour/Passion Project
- Spatial Reasoning
- Logic Puzzles, Brain Games, Analogies

STEM

- Engineering is Elementary
- Engineer Throughout the Year
- PBS Design Squad
- DefinedSTEM
- Project Lead the Way (PLTW)

Enrichment Events

Experience for all students to be enriched through events related to the curricular or extracurricular activities. Examples include after school clubs, PTA-sponsored events, leadership opportunities, visual and performing arts, and community service opportunities.