

How do KiwiCo projects and activities align with academic standards?

Many of our projects can be used to align with the Next Generation Science Standards and Common Core standards. Here are a few sample projects by grade.

Grades K–2

[Pinball Machine](#)
[Solar System](#)
[Kaleidoscope Play](#)
[Basketball Catapult](#)
[Fun with Flight](#)
[Mechanical Sweeper](#)
[Science of Trees](#)
[Astronaut Starter Kit](#)
[Veterinarian Starter Kit](#)

Grades 3–5, 6–8

[Drawbot Classroom Pack](#)
[Robot Crawler Classroom Pack](#)
[Automaton Classroom Pack](#)
[Mechanical Claw Classroom Pack](#)

[Automaton](#)
[Hydraulic Claw](#)
[Walking Robot](#)
[Planetarium](#)
[Bottle Rocket](#)
[Color-Mixing LED Crystal](#)
[Paper Circuits](#)
[Pulley Crane](#)
[Vortex Cannon](#)
[Arcade Catapult](#)

Grades 9–12

[Stereo Headphones](#)
[2-in-1 Lantern](#)
[Trashketball](#)
[Geometric Laser Projector](#)
[Hand-Crank Flashlight](#)
[Light-Up Speaker](#)

GRADES K–2

PINBALL MACHINE

NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.</p>	<ul style="list-style-type: none"> • Construct a pinball machine to demonstrate how an object’s motion changes when it collides with another object. • Conduct experiments to investigate how an unbalanced force on one side of a ball causes it to start moving, but forces that are perfectly balanced will cause the ball to stay still.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p>	<ul style="list-style-type: none"> • Make connections between push and pull forces and gameplay on the pinball machine.
<p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text. RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area. RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p>	<ul style="list-style-type: none"> • Ask questions and use context clues to learn new vocabulary related to motion and engineering design.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text. RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the explore! Magazine and Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> • Examine information given in both illustrations and text and identify how they support each other.
<p>RI.1.7 Use the illustrations and details in a text to describe its key ideas. RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text. RI.3.7 Use information gained from illustrations (e.g.,</p>	<ul style="list-style-type: none"> • Refer to illustrations and diagrams to describe scientific concepts.

maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

SOLAR SYSTEM	
NGSS	Activity Applications
<p>Engineering Design 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.</p>	<ul style="list-style-type: none"> • Build a mobile, complete with a light-up sun, to study the solar system. • Design a scale model of the solar system – on your neighborhood sidewalk – to explore the sizes and distances between planets.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p>	<ul style="list-style-type: none"> • Identify relationships between planets in the solar system, including comparing and contrasting how big they are, what they look like, and what they're made of.
<p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text. RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area. RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p>	<ul style="list-style-type: none"> • Ask questions and use context clues to learn domain-specific vocabulary related to the solar system, space exploration, and meteors.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text. RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the explore! Magazine and Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> • Examine information given in both illustrations and text and identify how they support each other.

<p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p> <p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> • Refer to illustrations and diagrams to describe scientific concepts.
--	--

KALEIDOSCOPE PLAY	
NGSS	Activity Applications
<p>Waves: Light and Sound 1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.</p>	<ul style="list-style-type: none"> • Construct a kaleidoscope that allows light to pass through a translucent wheel and reflect off mirrors.
<p>Structure and Properties of Matter 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.</p>	<ul style="list-style-type: none"> • Combine foam shapes into larger shapes and patterns, as well as mimic visual puzzles in an angled mirror.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p>	<ul style="list-style-type: none"> • Identify symmetry and patterns in different objects, as well as describe connections between the steps in technical instructions.
<p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text. RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area. RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p>	<ul style="list-style-type: none"> • Ask questions and use context clues to learn domain-specific vocabulary related to kaleidoscopes and symmetry.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text. RI.2.5 Know and use various text features (e.g.,</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the explore! Magazine and Inspiration Sheet.

<p>captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p> <p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> Examine information given in illustrations, photos, and text and identify how they support each other.
<p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p> <p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> Refer to illustrations and diagrams to describe scientific concepts.

BASKETBALL CATAPULT	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.</p>	<ul style="list-style-type: none"> Push down on the catapult's lever to apply an equal force to the ball and launch it. Adjust the catapult's angle and compare how different angles change the ball's motion.
<p>Motion and Stability: Forces and Interactions K-PS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.</p>	<ul style="list-style-type: none"> Test different launch angles to score at different hoop heights and distances. Evaluate successes and failures and adjust the launch angle accordingly.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.</p>	<ul style="list-style-type: none"> Describe how the catapult's launch angle affects the arc of the ball, as well as identify connections between steps in the technical instructions.
<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text. RI.1.4 Ask and answer questions to help determine or</p>	<ul style="list-style-type: none"> Ask questions and use context clues to learn new vocabulary related to physics

<p>clarify the meaning of words and phrases in a text. RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<p>and motion.</p>
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text. RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> • Examine information given in both illustrations and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts). RI.1.7 Use the illustrations and details in a text to describe its key ideas. RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> • Refer to illustrations and diagrams to describe scientific concepts.

FUN WITH FLIGHT	
NGSS	Activity Applications
<p>Engineering Design 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.</p>	<ul style="list-style-type: none"> • Build a stomp rocket and kite to learn about the science of flight. Adjust the rocket fins and kite tail to test how shape affects the flight path. • Make a helicopter, straw flyer, and airplane out of paper. Explore how their unique shapes cause them to fly differently.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.</p>	<ul style="list-style-type: none"> • Compare how rockets, planes, and other aircraft fly.

<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.</p> <p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.</p> <p>RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<ul style="list-style-type: none"> • Ask questions and use context clues to learn domain-specific vocabulary related to flight and aerodynamics.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p>RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Explore! Magazine and Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> • Examine information given in both illustrations and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).</p> <p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> • Refer to illustrations and diagrams to describe scientific concepts.

MECHANICAL SWEEPER	
NGSS	Activity Applications
<p>From Molecules to Organisms: Structures and Processes 1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.</p>	<ul style="list-style-type: none"> • Build a whale-inspired device that picks up small objects. Just as some whales have baleen (broom-like plates) to catch food, the mechanical sweeper has tabs that catch a pom-pom and sweep it up.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps</p>	<ul style="list-style-type: none"> • Compare different types of whales and describe how baleen helps some of them survive.

in technical procedures in a text.	
<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.</p> <p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.</p> <p>RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<ul style="list-style-type: none"> Ask questions and use context clues to learn domain-specific vocabulary related to whales and marine biology.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p>RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Explore! Magazine and Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> Examine information given in illustrations, photos, and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).</p> <p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> Refer to illustrations and diagrams to describe scientific concepts.

SCIENCE OF TREES	
NGSS	Activity Applications
<p>From Molecules to Organisms: Structures and Processes</p> <p>K-LS1-1</p> <p>Use observations to describe patterns of what plants and animals (including humans) need to survive.</p>	<ul style="list-style-type: none"> Experiment with capillary action and learn how plants use it to get water and nutrients from their roots to their leaves. Play a tilting tree game and explore the role of natural disasters.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts</p> <p>RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.</p> <p>RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text.</p> <p>RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps</p>	<ul style="list-style-type: none"> Make connections between capillary-action experiments (like using food coloring to dye flowers) and how trees rely on capillary action to survive.

in technical procedures in a text.	
<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.</p> <p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.</p> <p>RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<ul style="list-style-type: none"> Ask questions and use context clues to learn domain-specific vocabulary related to capillary action and plant life.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p>RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Explore! Magazine and Inspiration Sheet.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> Examine information given in illustrations, photos, and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).</p> <p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> Refer to illustrations and diagrams to describe scientific concepts.

ASTRONAUT STARTER KIT	
NGSS	Activity Applications
<p>Earth's Place in the Universe 1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.</p>	<ul style="list-style-type: none"> Build a solar system mobile to explore how planets orbit the Sun in a predictable pattern.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text. RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.</p>	<ul style="list-style-type: none"> Identify relationships between planets in the solar system, including how big they are and what they look like. Describe milestones in space travel and what it's like being an astronaut.

<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.</p> <p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.</p> <p>RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<ul style="list-style-type: none"> Ask questions and use context clues to learn domain-specific vocabulary related to space travel, solar system, and scientific exploration.
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p>RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Astronaut’s Guide, poster, and instructions.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> Examine information given in illustrations, photos, and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).</p> <p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> Refer to illustrations and diagrams to describe scientific concepts.

VETERINARIAN STARTER KIT	
NGSS	Activity Applications
<p>Biological Evolution: Unity and Diversity 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.</p>	<ul style="list-style-type: none"> Build an X-ray lightbox to explore animal anatomy. Compare and contrast animal systems to human systems.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts</p> <p>RI.K.3 With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.</p> <p>RI.1.3 Describe the connection between two individuals, events, ideas, or pieces of information in a text.</p> <p>RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.</p>	<ul style="list-style-type: none"> Draw connections between animal body language, behaviors, and symptoms.
<p>RI.K.4 With prompting and support, ask and answer questions about unknown words in a text.</p>	<ul style="list-style-type: none"> Ask questions and use context clues to learn domain-specific vocabulary

<p>RI.1.4 Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.</p> <p>RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p>	<p>related to veterinarians, animal anatomy, and biology.</p>
<p>RI.1.5 Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.</p> <p>RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Veterinarian’s Guide, poster, and instructions.
<p>RI.1.6 Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.</p>	<ul style="list-style-type: none"> • Examine information given in illustrations, photos, and text and identify how they support each other.
<p>RI.K.7 With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).</p> <p>RI.1.7 Use the illustrations and details in a text to describe its key ideas.</p> <p>RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.</p>	<ul style="list-style-type: none"> • Refer to illustrations and diagrams to describe scientific concepts.

GRADES 3–5, 6–8

DRAWBOT CLASSROOM PACK	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3–PS2–1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.</p>	<ul style="list-style-type: none"> • Make observations and collect data about how clay shape impacts the motor’s speed and vibration. • Investigate unbalanced forces that act on the spinning clay and cause changes in the motor’s speed. • Identify how forces acting on the motor cause the drawbot to vibrate, and how those vibrations in turn cause the drawbot to draw.
<p>Engineering Design 3–5–ETS1–1 Define a simple design problem reflecting a need or want that includes specific criteria for success and constraints on time, material, or cost.</p>	<ul style="list-style-type: none"> • Modify the drawbot to recreate a specific drawing. • Adjust predetermined variables to produce unique drawings.

<p>Engineering Design 3-5-ETS1-2 Generate and compare multiple solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> • Change variables of the drawbot, test, and observe in order to create unique drawings.
<p>Engineering Design 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>	<ul style="list-style-type: none"> • Investigate the drawbot's movement and discover which modifications produce the desired result – a specific drawing.
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Reading: Informational Texts RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</p>	<ul style="list-style-type: none"> • Ask and answer questions of your peers and teacher while referring to the technical instructions.
<p>RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> • Explain connections between steps in the technical instructions, as well as relationships between how the drawbot moves and key science topics.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to balanced and unbalanced forces, motion, and engineering design.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> • Analyze illustrations, diagrams, and text to build the drawbot.
<p>English Language Arts > Speaking & Listening SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics</p>	<ul style="list-style-type: none"> • Participate in teacher-led and group-led discussions about the project and how it works.

<p>and texts, building on others' ideas and expressing their own clearly.</p> <p>SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.</p> <p>SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.</p>	
<p>English Language Arts > Writing</p> <p>W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.</p>	<ul style="list-style-type: none"> • Draw on knowledge of balanced and unbalanced forces and gather data about how the drawbot moves.

ROBOT CRAWLER CLASSROOM PACK	
NGSS	Activity Applications
<p>Energy 4-PS3-4</p> <p>Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</p>	<ul style="list-style-type: none"> • Build, modify, and optimize a robot crawler that uses electrical energy to walk.
<p>Engineering Design 3-5-ETS1-1</p> <p>Define a simple design problem reflecting a need or want that includes specific criteria for success and constraints on time, material, or cost.</p>	<ul style="list-style-type: none"> • Use the given materials to create a robot that can walk forward or backward for a period of time and be used for experimentation.
<p>Engineering Design 3-5-ETS1-2</p> <p>Generate and compare multiple solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> • Adapt the robot crawler to walk as fast as possible by modifying the legs and cranks.
<p>Engineering Design 3-5-ETS1-3</p> <p>Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>	<ul style="list-style-type: none"> • Investigate multiple variables and improve the robot crawler's design to pull as many marbles as possible.
Common Core	Activity Applications

<p>English Language Arts > Reading: Informational Texts</p> <p>RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.</p> <p>RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</p>	<ul style="list-style-type: none"> • Ask and answer questions of your peers and teacher while referring to the technical instructions.
<p>RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p> <p>RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.</p> <p>RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> • Explain connections between steps in the technical instructions, as well as relationships between how the robot crawler walks and key science topics.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p> <p>RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.</p> <p>RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to energy, friction, and engineering design.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> • Analyze illustrations, diagrams, and text to build the robot crawler.
<p>English Language Arts > Speaking & Listening</p> <p>SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.</p> <p>SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.</p> <p>SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.</p>	<ul style="list-style-type: none"> • Participate in teacher-led and group-led discussions about the project and how it works.
<p>English Language Arts > Writing</p> <p>W.3.7 Conduct short research projects that build knowledge about a topic.</p> <p>W.4.7 Conduct short research projects that build knowledge through investigation of different aspects</p>	<ul style="list-style-type: none"> • Make observations, analyze cause and effect, and experiment with the robot crawler over several class periods to learn more about mechanics, energy,

of a topic.

and friction.

AUTOMATON CLASSROOM PACK	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.</p>	<ul style="list-style-type: none"> Observe and compare motions on the automaton, as well as predict how those motions repeat themselves.
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or want that includes specific criteria for success and constraints on time, material, or cost.</p>	<ul style="list-style-type: none"> Define the objective, materials, and design before creating mechanical art for the automaton.
<p>Engineering Design 3-5-ETS1-2 Generate and compare multiple solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> Experiment with cams and followers to recreate a given set of motions.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</p>	<ul style="list-style-type: none"> Ask and answer questions of your peers and teacher while referring to the technical instructions.
<p>RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> Explain connections between steps in the technical instructions, as well as relationships between how the automaton moves and key science topics.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to patterns of motion, cams and

<p>relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p>	<p>followers, and mechanical engineering.</p>
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> Analyze illustrations, diagrams, and text to build the automaton.
<p>English Language Arts > Speaking & Listening SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. SL.5.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.</p>	<ul style="list-style-type: none"> Participate in teacher-led and group-led discussions about the project and how it works.
<p>English Language Arts > Writing W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.</p>	<ul style="list-style-type: none"> Draw on real-life patterns of motion and gather data about how the drawbot moves.

MECHANICAL CLAW CLASSROOM PACK	
NGSS	Activity Applications
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or want that includes specific criteria for success and constraints on time, material, or cost.</p>	<ul style="list-style-type: none"> Build and modify the mechanical claw, taking into account constraints on the number of fingers and joints that can be built with the given materials.
<p>Engineering Design 3-5-ETS1-2 Generate and compare multiple solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> Compare how successful each claw redesign is in solving a specific problem like recreating a movement or picking up an object.

<p>Engineering Design 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>	<ul style="list-style-type: none"> Conduct multiple trials and iterate the claw's design to successfully pick up a wood ball, foam ball, and marble.
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Reading: Informational Texts RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</p>	<ul style="list-style-type: none"> Ask and answer questions of your peers and teacher while referring to the technical instructions.
<p>RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> Explain connections between steps in the technical instructions, as well as relationships between how the claw works and key science topics.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to tension, joints, and friction.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p>	<ul style="list-style-type: none"> Analyze illustrations, diagrams, and text to build the mechanical claw.
<p>English Language Arts > Speaking & Listening SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. SL.4.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. SL.5.1 Engage effectively in a range of collaborative</p>	<ul style="list-style-type: none"> Participate in teacher-led and group-led discussions about the project and how it works.

<p>discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.</p>	
<p>English Language Arts > Writing W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.</p>	<ul style="list-style-type: none"> • Draw connections between how the mechanical claw looks and works, as well as human hands and robotic arms.

AUTOMATON	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.</p>	<ul style="list-style-type: none"> • Observe up-and-down and round-and-round motions that repeat with each crank of the automaton.
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<ul style="list-style-type: none"> • Build an automaton with a specific pattern of motion in mind, using only materials from the crate or home.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> • Explain connections between steps in the technical instructions, as well as relationships between scientific ideas presented in the Tinker Zine.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative,</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to automaton design and history, mechanics, and engineering.

connotative, and technical meanings.	
RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p>	<ul style="list-style-type: none"> Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> Compare and synthesize information presented in articles (such as “Cabinet of Curiosities” and “The Anonymous Automaton”) and technical instructions to demonstrate fluency in scientific concepts.

HYDRAULIC CLAW	
NGSS	Activity Applications
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<ul style="list-style-type: none"> Use the hydraulic claw to solve design challenges, like lifting as much weight as possible and moving a cup as far as possible.
<p>Engineering Design 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> Modify and test the hydraulic claw while recording data and finding an optimal design to complete each task.
<p>Engineering Design</p>	<ul style="list-style-type: none"> Complete multiple trials to identify

<p>3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>	<p>success and failure points in the hydraulic claw's design.</p>
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> • Explain connections between steps in the technical instructions, as well as relationships between scientific ideas presented in the Tinker Zine.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to hydraulics, states of matter, and engineering.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p>	<ul style="list-style-type: none"> • Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.

<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> • Compare and synthesize information presented in articles (such as “Big Hydraulics” and “Water at Work”) and technical instructions to demonstrate fluency in scientific concepts.
---	---

WALKING ROBOT	
NGSS	Activity Applications
<p>Energy 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</p>	<ul style="list-style-type: none"> • Build, test, and modify a walking robot that converts electrical energy to mechanical energy.
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<ul style="list-style-type: none"> • Construct a robot that’s able to walk forward or backward for a period of time using only the crate materials.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<ul style="list-style-type: none"> • Explain connections between steps in the technical instructions, as well as relationships between scientific ideas presented in the Tinker Zine.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to robotics, mechanics, and engineering.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and

relevant to a given topic efficiently.	icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p>	<ul style="list-style-type: none"> Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> Compare and synthesize information presented in articles (such as “The Technologic Today” and “Red Planet Rover”) and technical instructions to demonstrate fluency in scientific concepts.

PLANETARIUM	
NGSS	Activity Applications
<p>Earth’s Systems 5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.</p>	<ul style="list-style-type: none"> Construct a light-up planetarium to model how the night sky changes throughout the year. Create a quadrant to measure the motion of the stars.
<p>Engineering Design 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p>	<ul style="list-style-type: none"> Create a planetarium that can successfully rotate views and produce star maps, using only the crate materials.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of</p>	<ul style="list-style-type: none"> Explain connections between steps in the technical instructions, as well as

<p>historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p> <p>RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.</p> <p>RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p>	<p>relationships between scientific ideas presented in the Tinker Zine.</p>
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p> <p>RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.</p> <p>RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p> <p>RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to astronomy, star navigation, and latitude and longitude.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p>	<ul style="list-style-type: none"> Refer to star maps, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> Compare and synthesize information presented in articles (such as “Motion of the Stars” and “Celestial Navigation”) and technical instructions to demonstrate fluency in scientific concepts.
<p>Math > Measurement & Data</p> <p>4.MD.C.5 Recognize angles as geometric shapes that are formed wherever two rays share a common</p>	<ul style="list-style-type: none"> Make a quadrant to calculate latitude and measure the motion of the stars.

endpoint, and understand concepts of angle measurement.	
4.MD.C.6 Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	<ul style="list-style-type: none"> Measure angles using a quadrant as a protractor.

BOTTLE ROCKET	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.</p>	<ul style="list-style-type: none"> Mix up a chemical reaction to launch a rocket. The rocket remains on the launcher until an unbalanced force is exerted. When pressure inside the rocket becomes too great, it pushes the rocket off the launcher and into the air.
<p>Engineering Design 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p> <p>MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p>	<ul style="list-style-type: none"> Test the rocket and modify as needed to help it fly higher. Adjust the fins to change how the rocket flies.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure</p>	<ul style="list-style-type: none"> Make connections between steps in the technical instructions, as well as explain how a chemical reaction causes the rocket to fly.

<p>when carrying out experiments, taking measurements, or performing technical tasks.</p>	
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings. RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to chemical reactions, air pressure, and engineering.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue. RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	<ul style="list-style-type: none"> Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> Compare and synthesize information presented in articles (such as “Fizz, Fizz” and “Pop Trivia”) and technical instructions to demonstrate fluency in scientific concepts.

COLOR-MIXING LED CRYSTAL

NGSS	Activity Applications
<p>Energy 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</p>	<ul style="list-style-type: none"> Build and test circuits that convert chemical energy to electrical energy to light.
<p>Energy 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</p>	<ul style="list-style-type: none"> Observe that a circuit must be closed for electric current to flow from the power source to the LEDs.
<p>Engineering Design 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p> <p>MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</p>	<ul style="list-style-type: none"> Turn LED circuits on or off to mix light, observe the results, and apply them to create specific colors.
Common Core	Activity Applications
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>	<ul style="list-style-type: none"> Draw connections between steps in the technical instructions, as well as explain how colors of light mix to create new colors.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to additive mixing, LEDs, and resistors.

<p>RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.</p> <p>RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p> <p>RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</p>	
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p> <p>RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	<ul style="list-style-type: none"> • Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> • Compare and synthesize information presented in articles (such as “In Living Color” and “Mixed-Up Colors”) and technical instructions to demonstrate fluency in scientific concepts.

PAPER CIRCUITS	
NGSS	Activity Applications
<p>Energy 4-PS3-4 Apply scientific ideas to design, test, and refine</p>	<ul style="list-style-type: none"> • Build and test circuits that convert chemical energy to electrical energy to light.

<p>a device that converts energy from one form to another.</p>	
<p>Energy 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</p>	<ul style="list-style-type: none"> Observe that a circuit must be closed for electric current to flow from the power source to the LEDs.
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>	<ul style="list-style-type: none"> Draw connections between steps in the technical instructions, as well as explain how electricity flows through a circuit.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings. RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.</p>	<ul style="list-style-type: none"> Acquire and use new vocabulary related to series and parallel circuits, electrons, and static electricity.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where,</p>	<ul style="list-style-type: none"> Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine,

<p>when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p> <p>RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	<p>to explain scientific concepts.</p>
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> • Compare and synthesize information presented in articles (such as “Electrons on the Move” and “Circuit Detective”) and technical instructions to demonstrate fluency in scientific concepts.

PULLEY CRANE	
NGSS	Activity Applications
<p>Motion and Stability: Forces and Interactions 3–PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.</p> <p>MS-PS2-2 Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.</p>	<ul style="list-style-type: none"> • Use pulleys to change the direction of force and lift heavy objects.
<p>Engineering Design 3–5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p> <p>MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a</p>	<ul style="list-style-type: none"> • Modify the pulley to lift different weights with the least amount of work.

<p>successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	
<p>Engineering Design 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p> <p>MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</p>	<ul style="list-style-type: none"> • Experiment with fixed and compound pulleys to lift the heaviest possible weight.
<p>Common Core</p>	<p>Activity Applications</p>
<p>Mathematics > Ratios & Proportional Relationships 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p>	<ul style="list-style-type: none"> • Use ratios to think about mechanical advantage. With more pulleys, you spread out the work and decrease how much force is applied.
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>	<ul style="list-style-type: none"> • Draw connections between steps in the technical instructions, as well as explain how mechanical advantage makes work easier.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to simple machines, fixed and compound pulleys, and mechanical advantage.

<p>RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</p>	
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p> <p>RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	<ul style="list-style-type: none"> • Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> • Compare and synthesize information presented in articles (such as “Built by Giants” and “Lift and Load”) and technical instructions to demonstrate fluency in scientific concepts.

VORTEX CANNON	
NGSS	Activity Applications
<p>Engineering Design 3–5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p> <p>MS-ETS1-1 Define the criteria and constraints of a design</p>	<ul style="list-style-type: none"> • Use the air-powered cannon to shoot targets at different distances.

<p>problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects RST.6–8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>	<ul style="list-style-type: none"> • Draw connections between steps in the technical instructions, as well as describe the connection between the vortex cannon and vortices in nature.
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area. RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area. RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings. RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</p>	<ul style="list-style-type: none"> • Acquire and use new vocabulary related to vortices, tornadoes, and hurricanes.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> • Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on</p>	<ul style="list-style-type: none"> • Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.

<p>Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p> <p>RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> • Compare and synthesize information presented in articles (such as “Vortex Power” and “Vortex Hunting”) and technical instructions to demonstrate fluency in scientific concepts.

ARCADE CATAPULT	
NGSS	Activity Applications
<p>Energy 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</p>	<ul style="list-style-type: none"> • Build a tension-powered catapult that converts potential energy into kinetic energy.
Common Core	Activity Applications
<p>Mathematics > Number & Operations in Base Ten 3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.</p> <p>4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.</p>	<ul style="list-style-type: none"> • Add or subtract point values while playing games with the Arcade Catapult.
<p>Mathematics > Number & Operations in Base Ten 3.NBT.A.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations.</p>	<ul style="list-style-type: none"> • Multiply the number of tally marks by the point value while playing games with the Arcade Catapult.
<p>English Language Arts > Reading: Informational Texts RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps</p>	<ul style="list-style-type: none"> • Draw connections between steps in the technical instructions, as well as explain the relationship between potential and kinetic energy.

<p>in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.</p> <p>RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.</p> <p>RI.5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.</p> <p>English Language Arts > Science & Technical Subjects</p> <p>RST.6–8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</p>	
<p>RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.</p> <p>RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.</p> <p>RI.5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.</p> <p>RI.6.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.</p> <p>RST.6–8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.</p>	<ul style="list-style-type: none"> ● Acquire and use new vocabulary related to energy and engineering.
<p>RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.</p>	<ul style="list-style-type: none"> ● Use bold print, tip text, headings, and icons to locate key information in the Tinker Zine and Blueprint.
<p>RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).</p> <p>RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.</p> <p>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.</p> <p>RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.</p> <p>RST.6–8.7 Integrate quantitative or technical information expressed in words in a text with a</p>	<ul style="list-style-type: none"> ● Refer to technical instructions, illustrations, and diagrams, as well as informational articles in the Tinker Zine, to explain scientific concepts.

version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	
<p>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.</p> <p>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.</p>	<ul style="list-style-type: none"> Compare and synthesize information presented in articles (such as “Engineering Your Own Arcade” and “Powered by Potential”) and technical instructions to demonstrate fluency in scientific concepts.

GRADES 9–12

STEREO HEADPHONES	
NGSS	Activity Applications
<p>Energy HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.</p>	<ul style="list-style-type: none"> Build headphones that convert electrical energy to sound. Use the headphones to listen to audio clips and experiment with sound.
<p>Engineering Design HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>	<ul style="list-style-type: none"> Engineer a solution to the crate’s Design Challenge (invent a sound amplifier using only materials from home) and answer the given design questions.
<p>Engineering Design HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	<ul style="list-style-type: none"> Assess how well the headphones create stereo sound. Explore how prototypes from this crate and inventions throughout history were redesigned.
Common Core	Activity Applications
<p>English Language Arts › Science & Technical Subjects RST.9–10.2 Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. RST.11–12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p>	<ul style="list-style-type: none"> Summarize and explain complex scientific concepts, from circuits to sound waves to mechanical equilibrium.
<p>RST.9–10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking</p>	<ul style="list-style-type: none"> Refer to multi-part, highly technical instructions to construct and

<p>measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>	<p>troubleshoot the project.</p>
<p>RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p>	<ul style="list-style-type: none"> Analyze diagrams and symbols, as well as acquire and use technical vocabulary related to sound and engineering (e.g. Geneva drive, stereo, switch).
<p>RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>	<ul style="list-style-type: none"> Compare information in the text about stereo sound with observations from your own experiments.
<p>English Language Arts > History/Social Studies RH.9-10.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text. RH.11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.</p>	<ul style="list-style-type: none"> Describe the progression of key inventions throughout history and how they developed into modern-day products.

2-IN-1 LANTERN	
NGSS	Activity Applications
<p>Energy HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.</p>	<ul style="list-style-type: none"> Build a portable lantern that converts chemical energy to light.
<p>Engineering Design HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>	<ul style="list-style-type: none"> Engineer a solution to the crate's Design Challenge (invent a hands-free using only materials from home) and answer the given design questions.

<p>Engineering Design HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	<ul style="list-style-type: none"> Assess how well the lantern (using diffused reflection) and flashlight (using focused reflection) light up a space. Explore how prototypes from this crate and inventions throughout history were redesigned.
<p>Common Core</p>	<p>Activity Applications</p>
<p>English Language Arts > Science & Technical Subjects RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p>	<ul style="list-style-type: none"> Summarize and explain complex scientific concepts, including optics and reflection.
<p>RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>	<ul style="list-style-type: none"> Refer to multi-part, highly technical instructions to construct and troubleshoot the project.
<p>RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p>	<ul style="list-style-type: none"> Analyze diagrams and symbols, as well as acquire and use technical vocabulary related to light and engineering (e.g. LED, reflector, heat sink).
<p>RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>	<ul style="list-style-type: none"> Compare information in the text about optics with observations from your own experiments.
<p>English Language Arts > History/Social Studies RH.9-10.2 Determine the central ideas or information</p>	<ul style="list-style-type: none"> Describe the progression of key inventions throughout history and how they developed into modern-day

<p>of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text. RH.11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.</p>	<p>products.</p>
--	------------------

TRASHKETBALL	
NGSS	Activity Applications
<p>Engineering Design HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p>	<ul style="list-style-type: none"> • Engineer a solution to the crate’s Design Challenge (develop new features for the trashketball) and answer the given design questions.
<p>Engineering Design HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p>	<ul style="list-style-type: none"> • Assess how latches, hinges, and linkages work in a pop-action lid. Explore how prototypes from this crate and inventions throughout history were redesigned.
Common Core	Activity Applications
<p>English Language Arts > Science & Technical Subjects RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</p>	<ul style="list-style-type: none"> • Summarize and explain complex scientific concepts, including parabolas, inertia, and gravity.
<p>RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p>	<ul style="list-style-type: none"> • Refer to multi-part, highly technical instructions to construct and troubleshoot the project.

<p>RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</p> <p>RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p>	<ul style="list-style-type: none"> Analyze diagrams and symbols, as well as acquire and use technical vocabulary related to engineering (e.g. latch, linkage, angled connector).
<p>RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</p> <p>RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p>	<ul style="list-style-type: none"> Compare information in the text about parabolas, angle, and gravity with observations from your own experiments.
<p>English Language Arts > History/Social Studies</p> <p>RH.9-10.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.</p> <p>RH.11-12.2 Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.</p>	<ul style="list-style-type: none"> Describe the progression of key inventions throughout history and how they developed into modern-day products.

GEOMETRIC LASER PROJECTOR	
NGSS	Activity Applications
<p>Waves and Electromagnetic Radiation HS-PS4-5</p> <p>Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.</p>	<ul style="list-style-type: none"> Explain properties of lasers and describe how the laser inside the projector reflects off mirrors to create changing patterns.
Common Core	Activity Applications
<p>English Language Arts > Science & Technical Subjects</p> <p>RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</p> <p>RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking</p>	<ul style="list-style-type: none"> Refer to multi-part, highly technical instructions to construct and troubleshoot the geometric laser project.

measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	
<p>RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</p> <p>RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p>	<ul style="list-style-type: none"> Analyze symbols in a circuit diagram, as well as acquire and use technical vocabulary such as potentiometers, resistors, and electric motors.
<p>RST.9-10.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p>	<ul style="list-style-type: none"> Identify and explain connections between concepts like electrical energy, electromagnetism, and resistance.

HAND-CRANK FLASHLIGHT	
NGSS	Activity Applications
<p>Engineering Design MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> Build a battery-free flashlight that successfully lights up and can be used in outdoor adventures or emergencies.
<p>Energy HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy</p>	<ul style="list-style-type: none"> Build a flashlight that converts mechanical energy to electrical energy to light, using only the given materials.
Common Core	Activity Applications
<p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</p>	<ul style="list-style-type: none"> Refer to multi-part, highly technical instructions to construct and troubleshoot the hand-crank flashlight.
<p>RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.</p>	<ul style="list-style-type: none"> Analyze symbols in a circuit diagram, as well as acquire and use technical vocabulary related to electrical energy,

<p>RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</p>	<p>electromagnetism, and circuits.</p>
<p>RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p>	<ul style="list-style-type: none"> • Compare symbols in a circuit diagram with written explanations of breadboards, stepper motors, and capacitors.

LIGHT-UP SPEAKER	
NGSS	Activity Applications
<p>Engineering Design MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</p>	<ul style="list-style-type: none"> • Build a speaker that successfully lights up and produces sound.
<p>Energy HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.</p>	<ul style="list-style-type: none"> • Build a speaker that converts electrical energy to light and sound, using only the given materials.
Common Core	Activity Applications
<p>English Language Arts > Science & Technical Subjects RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</p>	<ul style="list-style-type: none"> • Refer to multi-part, highly technical instructions to construct and troubleshoot the light-up speaker.
<p>RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</p>	<ul style="list-style-type: none"> • Analyze symbols in a circuit diagram, as well as acquire and use technical vocabulary related to sound, electromagnetism, and resistance.
<p>RST.6-8.7 Integrate quantitative or technical</p>	<ul style="list-style-type: none"> • Compare symbols in a circuit diagram

information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

with written explanations of breadboards, transistors, and speakers.