

## PLTW Launch Module Descriptions

### Aligned to Kindergarten Standards

- **Structure and Function: Exploring Design** – Students discover the design process and how engineers influence their lives. They explore the elements of structure and function by identifying products around them designed by engineers and asking questions engineers might ask. They are introduced to a design problem through a story in which Angelina wants to design a paintbrush. Students apply their knowledge from the module to design their own paintbrushes.
- **Pushes and Pulls** – Students investigate pushes and pulls on the motion of an object and develop knowledge and skills related to forces of differing strengths and directions. Their explorations include pushes and pulls found in their everyday world, such as pushing a friend on a swing or pulling a wagon. In this module's design problem, Suzi needs to move rocks from her yard so she can install a swing set. Students work through the problem by applying what they learn about forces.
- **Structure and Function: Human Body** – Students explore the relationship between structure and function in the human body. They examine major organs within the body and investigate how the structure of each is related to its function. Students are introduced to the design problem through a story in which Angelina falls off the monkey bars and breaks her arm. Students learn about the diagnosis and treatment of her injury and then work to design and build a cast for Angelina.
- **Animals and Algorithms** – Students explore the nature of computers and the ways humans control and use technology. Starting with an unplugged activity, students learn about the sequential nature of computer programs. Students are inspired by a story in which Angelina, Mylo, and Suzi make videos to teach preschoolers about animals in their habitats. Then, students work in small groups to design and program a simple digital animation about an animal in its habitat.

### Aligned to First-Grade Standards

- **Light and Sound** – Students investigate the properties of light and sound, including vibration from sound waves and the effect of different materials on the path of a beam of light. After students develop an understanding of light and sound, they are challenged to solve a design problem Mylo, Suzi, and Angelina face. In the story, the characters are lost and must use only the materials in their backpack to communicate over a distance by using light and/or sound. Students use the design process to sketch, build, test, and reflect on a device that solves this design problem.
- **Light: Observing the Sun, Moon, and Stars** – After observing the sun, moon, and stars, students identify and describe patterns in their recorded data. Angelina, Mylo, and Suzi introduce the design problem, which challenges students to create a playground structure designed to protect students from ultraviolet radiation. Students utilize their knowledge of light to design, build, and test structures created to solve this problem. Students then evaluate their designs, share their findings, and explore ideas to improve their structures based on the testing data.
- **Animal Adaptations** – Students explore animal adaptations for protection, camouflage, food obtainment, and locomotion. Students learn what it means for an organism to be adapted to its environment and how different adaptations can be categorized. Students are introduced to the design challenge when Suzi announces she is visiting the Sahara and needs to get prepared for her trip. Students are challenged to design the ideal shoe for travelers to wear in extreme environments, applying what they have learned and looking to plant and animal adaptations to guide their designs.
- **Animated Storytelling** – Students explore the sequential nature of computer programs through hands-on activities, both with and without a computer. They examine key aspects of storytelling and devise how to transition a narrative from page to screen. Students discover the design problem through a story about Angelina, Mylo, and Suzi, who wish they could find a way to create a story with characters who move and interact with each other. Combining fundamental principles of computer science with story-building skills, students develop animations that showcase characters, settings, actions, and events from short stories of their own creation.

### Aligned to Second-Grade Standards

- **Materials Science: Properties of Matter** – Students investigate and classify different kinds of materials by their observable properties, including color and texture. They learn about states of matter and properties of materials including insulators and conductors. In the design problem, Angelina, Mylo, and Suzi, are challenged to keep ice pops cold during a soccer game – without a cooler. Students apply their knowledge and skills to determine the best material to solve this design problem and then evaluate how their designs might be improved.
- **Materials Science: Form and Function** – Students research the variety of ways animals disperse seeds and pollinate plants. They expand their understanding of properties of matter as they consider the form and function involved in seed dispersal and pollination. Students are introduced to the design problem when Angelina, Mylo, and Suzi are tasked with starting a wildflower garden on an expansive plot outside of their school. To solve the design problem, students apply their knowledge and skills to design, build, test, and reflect on a device that mimics a way in which animals disperse seeds or pollinate plants.
- **The Changing Earth** – Students explore how the surface of the Earth is always changing. They are introduced to different types of maps and explore how these maps convey different information about the world in which we live, including where water is found on Earth. Angelina, Mylo, and Suzi introduce the design problem when faced with the challenge of helping a community threatened by a potential landslide. Students investigate the different forces that shape the surface of the Earth and design solutions to limit the impact of erosion on this fictional community, which is located at the bottom of a hill that was recently destabilized by a fire.

- **Grids and Games** – Students investigate numerical relationships while learning about the sequence and structure required in computer programs. Starting with computer-free activities and moving to tablet-based challenges, students apply addition and subtraction strategies to make characters move on a grid. Angelina presents the design problem when she expresses her desire to design a game she can play on her tablet. Using skills and knowledge gained from these activities, students work together in groups to design and develop a game in which a player interacts with objects on a tablet screen.

#### Aligned to Third-Grade Standards

- **Stability and Motion: Science of Flight** – In this module, students learn about the forces involved in flight as well as Newton's Laws of Motion. They design, build, and test an experimental model glider to find out how air and other forces affect its flight. Students discover aeronautics alongside Angelina, Mylo, and Suzi and are inspired by the characters' desire to use their skills to help those in need. Students apply the design process to the problem of delivering aid to an area where supplies must be airlifted in and dropped to the ground from an aircraft.
- **Stability and Motion: Forces and Interactions** – Students explore simple machines such as wheel and axles, levers, the inclined plane, and more. They investigate the effects of balanced and unbalanced forces on the motion of an object. Angelina, Mylo, and Suzi go on a field trip to the zoo and are faced with the design problem of how to rescue a trapped tiger. Students then apply their knowledge of forces and devise a way to rescue a heavy zoo animal while keeping it safe throughout the process.
- **Variation of Traits** – Students investigate the differences between inherited genetic traits and traits learned or influenced by the environment. They explore the phenomena that offspring may express different traits than parents as they learn about dominant and recessive genes and also investigate how predicted outcomes compare to experimental results. Angelina, Mylo, and Suzi introduce the design problem when challenged to examine different traits found in three sets of seeds. Students then model how the gene for stem color is passed on and expressed among sample sets.
- **Programming Patterns** – This module introduces students to the power of modularity and abstraction. Starting with computer-free activities and progressing to programming in a blocks-based language on a tablet, students learn how to think computationally about a problem. Angelina, Mylo, and Suzi set the stage for the design problem as they discuss their desire to create video games on their tablet. Students then create a tablet game using modular functions and branching logic.

#### Aligned to Fourth-Grade Standards

- **Energy: Collisions** – Students explore the properties of mechanisms and how they change energy by transferring direction, speed, type of movement, and force. Students discover a variety of ways potential energy can be stored and released as kinetic energy. They explain the relationship between the speed of an object and the energy of that object, as well as predict the transfer of energy as a result of a collision between two objects. The design problem is introduced by Angelina, Mylo, and Suzi watching amusement park bumper cars collide. As students solve the problem for this module, they apply their knowledge and skills to develop a vehicle restraint system.
- **Energy: Conversion** – Students identify the conversion of energy between forms and the energy transfer required to move energy from place to place. They also identify and explain how energy can be converted to meet a human need or want. The design problem is introduced through Angelina, Mylo, and Suzi, who need to move donated food from a truck to a food pantry. Students then apply scientific ideas about the conversion of energy to solve this design problem.
- **Input/Output: Computer Systems** – In this exploration of how computers work, students are encouraged to make analogies between the parts of the human body and parts that make up a computer. Students investigate reaction time as a measure of nervous system function. After Mylo suffers a concussion, his friends become interested in how to diagnose concussions and create a reaction-time computer program to assess a baseline before a concussion occurs. Students apply what they have learned to build their own reaction-time measurement devices on tablets. This module has strong connections to the fourth-grade Human Brain module.
- **Input/Output: Human Brain** – Students discover how signals passing from cell to cell allow us to receive stimuli from the outside world, transmit this information to the brain for processing, and then send out a signal to generate a response. When Mylo experiences a concussion after falling off a skateboard while not wearing a helmet, he and his friends are motivated to raise awareness about concussions. Inspired by this design problem, students work as part of a team to design, plan, and create a video or podcast to educate children on identifying and preventing concussions.

#### Aligned to Fifth-Grade Standards

- **Robotics and Automation** – Students explore the ways robots are used in today's world and their impact on society and the environment. Students learn about a variety of robotic components as they build and test mobile robots that may be controlled remotely. Angelina, Mylo, and Suzi are tasked with designing a mobile robot that can remove hazardous materials from a disaster site. Students are then challenged to design, model, and test a mobile robot that solves this design problem.
- **Robotics and Automation: Challenge** – Students expand their understanding of robotics as they explore mechanical design and computer programming. This module focuses on developing skills needed to build and program autonomous robots. Angelina, Mylo, and Suzi are tasked with designing an automatic-guided vehicle to deliver supplies to a specific area in a hospital without being remotely controlled by a person. Inspired by this design problem, students work with a group to apply their knowledge to design, build, test, and refine a mobile robot that meets a set of design constraints.
- **Infection: Detection** – Students explore transmission of infection, agents of disease, and mechanisms the body uses to stay healthy. Through a simulation, they compare communicable and non-communicable diseases. In the design problem, Suzi comes down with a fever and sore throat, and her friends wonder how this illness might have spread across the school. Students tackle the design problem by examining evidence to deduce the agent of infection, the likely source of the outbreak, and the path of transmission through a school. They design and run an experiment related to limiting the spread of germs and apply results to propose appropriate prevention methods.
- **Infection: Modeling and Simulation** – In this module, students investigate models and simulations and discover powerful ideas about computing. The design problem – related to the Infection: Detection module – is introduced as Mylo and Angelina look to model an infectious disease to simulate how an illness spread through their class. Applying their new understandings, students program their own models and collect data by running simulations with different parameters.