LEGO® Education Alignment to PA STEELS 2022 - Technology and Engineering

Grade	Discipline	Strand	Code	Performance Expectation (Standard) *Students who demonstrate understanding can*	Clarifying Statement	Solution	Lessons
K-2	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.K-2.A	Identify and use everyday symbols.	Symbols are used as a means of communication in the technological world. Examples include road signs, symbols for persons with disabilities, and icons on a screen.		
K-2	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.K-2.B	Describe qualities of everyday products.	Technology assessment, or the ability to critically analyze a technology's effectiveness, is a skill that should be introduced early and consistently. Is a lunchbox hard or soft, metal or plastic, insulated or not? Is there enough space inside for the items brought for lunch?		
K-2	Technology and Engineering	Impacts of Technology	3.5.K-2.C	Explain ways that technology helps with everyday tasks	Children should be able to identify activities they engage in regularly and describe how different technologies help them do these tasks more easily. Contrasting the lifestyles of earlier societies with their own will provide ample examples.	STEAMPark CodingExpress SPIKEEssential	STEAM Park (PK-K): Ramps STEAM Park (PK-K): Moving on Water SP Maker (PK-K): Make a Machine to Help Mr. Bear Coding Express (PK-K): First Trip Coding Express (PK-K): O-Shaped Track - Looping Science - See It! Hear It! Build It! (G1): Communicate with Light and Sound Science in Nature and Our Daily Life (G2): Redesigning to Make New Objects Great Adventures (1-2): Animal Alarm Amazing Amusement Park (1-2): The Fast Lane Amazing Amusement Park (1-2): Snack Stand Science - See It! Hear It! Build It! (G1): Illumination
K-2	Technology and Engineering	Impacts of Technology	3.5.K-2.D	Select ways to reduce, reuse, and recycle resources in daily life	Children should give examples of the ways they handle waste at school or at home.	SPIKEEssential	Quirky Creations (3-5): Trash Monster Machine
K-2	Technology and Engineering	Impacts of Technology	3.5.K-2.E	Illustrate helpful and harmful effects of technology	Children can examine a familiar technology and explain how it can be both helpful and harmful. For example, a crayon can be used to draw creatively but can also be used to write on bedroom walls.		
K-2	Technology and Engineering	Influence of Society on Technological Development	3.5.K-2.F	Investigate the use of technologies in the home and community.	Children learn to use their senses to gather data and make observations about technologies in their everyday environment. Toasters, microwaves, stoves, and refrigerators may be used to create breakfasts before going to school in western cultures. In other societies, different food storage and preparation technologies are used for this same purpose.	SPIKEEssential	Science - See It! Hear It! Build It! (G1): Illumination Science in Nature and Our Daily Life (G2): Redesigning to Make New Objects
K-2	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.K-2.G	Explain the tools and techniques that people use to help them do things.	By using technology and engineering, people adapt the natural world to meet their needs and wants and to solve problems. All people use tools and processes created through technology and engineering in every aspect of their daily tasks.		
K-2	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.K-2.H	Explain the needs and wants of individuals and societies.	Basic human needs include food, water, and shelter. Beyond these, children can discuss other needs and wants that have resulted in new technologies. This helps them to begin to see that other people's thoughts, feelings, needs, and wants may differ from their own.	SPIKEEssential	Amazing Amusement Park (1-2): The Fast Lane Amazing Amusement Park (1-2): Classic Carousel Amazing Amusement Park (1-2): The Perfect Swing Amazing Amusement Park (1-2): Snack Stand Amazing Amusement Park (1-2): Twirling Teacups Amazing Amusement Park (1-2): The Spinning Ferris Wheel Amazing Amusement Park (1-2): The Most Amazing Amusement Park
K-2	Technology and Engineering	Impacts of Technology	3.5.K-2.I	Compare simple technologies to evaluate their impacts	Children can look at simple tools in their home or school to compare how they impact life. For example, how does a hand-operated pencil sharpener versus an electric one impact people?		

K-2	Technology and Engineering	Impacts of Technology	3.5.K-2.J	Design new technologies that could improve their daily lives	Children can brainstorm needs or wants and devise possible solutions to meet a need. Teachers and parents can pose “what if?” questions to young children. “What if you and your friends could build something in the school’s playground to make recess more fun? What would you build?”	SPIKEEssential	Amazing Amusement Park (1-2): The Most Amazing Amusement Park Science - See It! Hear It! Build It! (G1): Using Ideas from Nature Science in Nature and Our Daily Life (G2): Protection from Wind
K-2	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.K-2.K	Safely use tools to complete tasks.	Many tools have specific functions and selecting the right tool makes the task easier. People use tools to make objects, to achieve a desired outcome, and to communicate. Children use scissors to cut paper, glue sticks to fasten components together, markers to sketch ideas, and computers to search for information.		
K-2	Technology and Engineering	Influence of Society on Technological Development	3.5.K-2.L	Explore how technologies are developed to meet individual and societal needs and wants	For example, people need clean, safe water, so systems are developed to provide water to homes and schools. Human-made technology requires some knowledge of the natural world and uses materials from it as well.		
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.M	Demonstrate essential skills of the engineering design process	Young children identify that there are some essential skills, such as creative thinking, building, and testing, that are required to succeed in technology and engineering design.	STEAMPark BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.K-2.N	Analyze how things work.	This can be done by safely and carefully taking something apart and then putting it back together. The ability to observe, analyze, and document is vital to successfully accomplishing this task.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.O	Illustrate that there are different solutions to a design and that none are perfect.	Young children recognize that there is more than one plausible solution to a design challenge.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.P	Discuss that all designs have different characteristics that can be described	Young children recognize and categorize basic features of design, which represent principles and elements of design. In drawing, they begin to differentiate between lines, colors, and shapes. In thinking about early ideas on design, they might brainstorm with other children, draw sketches, and see how well their ideas worked out.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.Q	Apply skills necessary for making in design.	Providing opportunities to use tools and manipulate materials can facilitate making skills in young children. Structuring design experiences at this age may take the form of tinkering and play.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.K-2.R	Draw connections between technology and human experience	Young children learn to count through nursery rhymes and playing with manipulatives. Children’s books often include graphics and some even generate sound. Teachers can have students identify technological connections from their homes, traveling in vehicles, and other experiences, and through this help young students understand the role of technology in their lives.		
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.S	Apply design concepts, principles, and processes through play and exploration	Design experiences build on young children’s natural curiosity, desire to explore, and persistence. Familiar materials, tools, and environments will enhance these experiences.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.T	Demonstrate that designs have requirements.	Young children recognize that all designs must meet certain expectations. These expectations are related to the purpose, function, and requirements of a solution.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Design in Technology and Engineering Education	3.5.K-2.U	Explain that design is a response to wants and needs	Young children begin to understand that design is driven by wants and needs. These wants and needs often derive from familiar environments such as home, school, and community.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons
K-2	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.K-2.V	Explain that materials are selected for use because they possess desirable properties and characteristics.	Paper, wood, cloth, cardboard, and found objects are the most common materials young children use in making the items they design. By working with materials, they learn through observation and testing which materials perform better for given tasks.	SPIKEEssential	Science in Nature and Our Daily Life (G2): Redesigning to Make New Objects Science in Nature and Our Daily Life (G2): Classify and Choose Materials
K-2	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.K-2.W	Apply concepts and skills from technology and engineering activities that reinforce concepts and skills across multiple areas.	Young children can use building blocks to develop computational and critical thinking skills by introducing design, measurement, and structural concepts. The intentional translation of skills learned in physical education, such as teamwork, can be applied to problem solving. Drawing in art class can lead to new ways of thinking about design and visual appeal.	STEAMPark CodingExpress BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons ALL Lessons ALL Lessons

K-2	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.K-2.X	Develop a plan in order to complete a task.	For example, young children learn that if they want to accomplish something, such as design and make a birthday card for a parent, they must have the materials available, and they must have the card ready by a given date.	**SPIKEEssential**	**Great Adventures (1-2): The Great Desert Adventure** **Amazing Amusement Park (1-2): The Most Amazing Amusement Park** **Science - See It! Hear It! Build It! (G1): Using Ideas from Nature** **Science in Nature and Our Daily Life (G2): Protection from Wind**
K-2	Technology and Engineering	History of Technology	3.5.K-2.Y	Discuss how the way people live and work has changed throughout history because of technology.	Once people learned to provide shelter for themselves—first with simple huts and later with houses, castles, and skyscrapers—they were no longer forced to seek natural shelter, such as caves. The invention of the plow and other agricultural technologies, along with such simple devices as fish hooks and the bow and arrow, made it easier for people to feed themselves, freeing up time for other pursuits. People's ability to communicate with one another over space and time has been improved by the use of tools and processes like smoke signals, alarms, papermaking, printing, telephones, and the internet.	STEAMPark	STEAM Park (PK-K): Functional Elements STEAM Park (PK-K): Ramps STEAM Park (PK-K): Gears
						SPIKEEssential	Great Adventures (1-2): Cave Car Great Adventures (1-2): Animal Alarm Science - See It! Hear It! Build It! (G1): Illumination Science - See It! Hear It! Build It! (G1): Communicate with Light and Sound
K-2	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.K-2.Z	Illustrate how systems have parts or components that work together to accomplish a goal	Once people learned to provide shelter for themselves—first with simple huts and later with houses, castles, and skyscrapers—they were no longer forced to seek natural shelter, such as caves. The invention of the plow and other agricultural technologies, along with such simple devices as fish hooks and the bow and arrow, made it easier for people to feed themselves, freeing up time for other pursuits. People's ability to communicate with one another over space and time has been improved by the use of tools and processes like smoke signals, alarms, papermaking, printing, telephones, and the internet.		
K-2	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.K-2.AA	Demonstrate that creating can be done by anyone	Using technology and engineering tools and techniques, anyone can design or improve things to enhance their lives. Creation of new knowledge, approaches, and inventions can occur through either individual or collaborative efforts. Even young children can view themselves as creators.	STEAMPark	ALL Lessons
						CodingExpress	ALL Lessons
						BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
K-2	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.K-2.BB	Compare the natural world and human-made world	The natural world includes trees, plants, animals, rivers, oceans, mountains, and other items that make up the earth's landscape, biomes, and climate. The human-made world includes pencils, rulers, computers, buildings, airplanes, roads, refrigerators, communication devices, and other items developed for the betterment of humans.		
K-2	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.K-2.CC	Discuss the roles of scientists, engineers, technologists, and others who work with technology.	Technological advancement does not occur without the teamwork of many people who have knowledge and skills in distinct areas. Being able to recognize the unique contributions of these individuals is a necessary part of the technological and engineering design process. Young children can develop an appreciation of how people with different specialties can collaborate to design, create, build, and test a product or system. Analogies often work well with students in this grade band. For example, they can understand how a vehicle is purchased from a dealer, maintained by a mechanic at a service center, and driven by a family member. All of these people have something to do with the vehicle, but each in their own way.		
K-2	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.K-2.DD	Collaborate effectively as a member of a team	To operate at the most effective level, team members must learn to communicate and work together as a unit. Strategies to work together in a team must be modeled by the teacher and laid out as an expectation within the laboratory-classroom setting.	STEAMPark	ALL Lessons
						CodingExpress	ALL Lessons
						BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
3-5	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.3-5.A	use appropriate symbols, numbers and words to communicate key ideas about technological products and systems.	Most of these symbols are found in everyday life, such as the alphabet, numbers, punctuation marks, or commercial logos. There are technical symbols to be aware of as well, including hazardous material symbols, caution signs, and the recycling logo.		
3-5	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.3-5.B	examine information to assess the trade-offs of using a product or system.	To assess technologies, information such as cost, function, durability, and warranties could be collected on products such as toys, food, games, health products, school supplies, and clothes to assess the costs, benefits, and trade-offs of these products or systems.		
3-5	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.3-5.C	follow directions to complete a technological task.	Skill development typically starts with guided instruction, and many tasks require following a specific sequence of steps.	BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons

3-5	Technology and Engineering	Impacts of Technology	3.5.3-5.D	predict how certain aspects of their daily lives would be different without given technologies.	Historical examples of daily life before modern technologies such as airplanes, computers, modern agriculture, sanitation, and so on will give students opportunities to consider how their lives have been impacted by technology.	SPIKEEssential	Science We Cannot See (G5): Daytime and Nighttime Science Connections (G4): Prepare for Natural Hazards Animals and Their Environments (G3): Preparing for the Weather Happy Traveler (3-5): River Ferry Happy Traveler (3-5): Taxi! Taxi! Happy Traveler (3-5): Hovering Helicopter Happy Traveler (3-5): Swamp Boat Happy Traveler (3-5): Cable Car Happy Traveler (3-5): Big Bus Happy Traveler (3-5): Get Around Town
3-5	Technology and Engineering	Impacts of Technology	3.5.3-5.E	explain why responsible use of technology requires sustainable management of resources.	Building on their initial understandings about material resources, students can tie concepts of renewability, scarcity, and resource demand to sustainable use, defined as availability of a resource for use by future generations.	SPIKEEssential	Science Connections (G4): Energy Resources
3-5	Technology and Engineering	Impacts of Technology	3.5.3-5.F	classify resources used to create technologies as either renewable or nonrenewable.	An introduction to material resources and how they are recovered will help students understand the concept of renewability and its importance and can be tied to concepts they learn in science.	SPIKEEssential	Science Connections (G4): Energy Resources
3-5	Technology and Engineering	Impacts of Technology	3.5.3-5.G	describe the helpful and harmful effects of technology.	Students can begin to explore more fully the idea of intended, unintended, positive, and negative outcomes inherent in technologies. Students at this age learn how their own lives have been impacted through technology and how technological processes generate undesirable waste and emissions.	SPIKEEssential	Quirky Creations (3-5): Trash Monster Machine Science We Cannot See (G5): Protect the Environment Happy Traveler (3-5): River Ferry Happy Traveler (3-5): Taxi! Taxi! Happy Traveler (3-5): Hovering Helicopter Happy Traveler (3-5): Swamp Boat Happy Traveler (3-5): Cable Car Happy Traveler (3-5): Big Bus
3-5	Technology and Engineering	Influence of Society on Technological Development	3.5.3-5.H	determine factors that influence changes in a society's technological systems or infrastructure.	Individual, family, and community values as well as environmental and economic factors may expand or limit the development of technologies. Students should recognize that products and systems are designed and marketed for a variety of purposes, including to generate profit. Sometimes these changes come at the expense of human and environmental health.		
3-5	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.3-5.I	design solutions by safely using tools, materials, and skills.	People use appropriate tools and skills to help them do their work (e.g., a carpenter uses a hammer to build a house; a doctor uses diagnostic imaging machines to treat patients). People also use resources, such as metal, wood, cloth, and stone, to make things they use every day.	SPIKEEssential	Science in Nature and Our Daily Life (G2): Redesigning to Make New Objects Science in Nature and Our Daily Life (G2): Classify and Choose Materials
3-5	Technology and Engineering	Influence of Society on Technological Development	3.5.3-5.J	explain how technologies are developed or adapted when individual or societal needs and wants change.	More useful and efficient technologies are developed when society identifies a need. When something changes in the environment, technologies are developed in response to the new conditions. For example, if a local water source runs dry, solutions must be designed for alternative water purification and transport. Engineers improve existing technologies by designing and creating to meet new constraints and requirements.	SPIKEEssential	Animals and Their Environments (G3): Solving Problems When Environments Change
3-5	Technology and Engineering	Impacts of Technology	3.5.3-5.K	judge technologies to determine the best one to use to complete a given task or meet a need.	Through exposure to the function and use of various age-appropriate tools/ technologies, students can determine which tools are best for a given task and can explain their selection.	SPIKEEssential	Quirky Creations (3-5): Good Morning Machine Quirky Creations (3-5): Big Little Helper Quirky Creations (3-5): High-Tech Playground Quirky Creations (3-5): Trash Monster Machine Quirky Creations (3-5): Winning Goal Quirky Creations (3-5): Literary Randomizer Quirky Creations (3-5): Your School Creation
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.L	demonstrate how tools and machines extend human capabilities, such as holding, lifting, carrying, fastening, separating, and computing.	The use of tools and machines, such as glue guns, mini-saws, rulers, scissors, gears, clamps, and computers, makes it possible for people to accomplish more tasks.	SPIKEEssential	Quirky Creations (3-5): Big Little Helper

3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.M	demonstrate essential skills of the engineering design process.	Young children identify that there are some essential skills, such as creative thinking, building, and testing, that are required to succeed in technology and engineering design.	SPIKEEssential	Quirky Creations (3-5): Good Morning Machine Quirky Creations (3-5): Big Little Helper Quirky Creations (3-5): High-Tech Playground Quirky Creations (3-5): Trash Monster Machine Quirky Creations (3-5): Winning Goal Quirky Creations (3-5): Literary Randomizer Quirky Creations (3-5): Your School Creation
3-5	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.3-5.N	identify why a product or system is not working properly.	Technological systems and products do not last forever. For elementary students this can be unsettling when they expect everything to work every time. A chain coming off a bike gear becomes a teachable moment on how things function and how to get them working again. This concept is important for all students to learn. Teachers can ask questions to identify why the technology is not working properly, what could be a logical explanation of the problem, and what might be the easiest solution to address the problem.	SPIKEEssential	All Lessons - Debugging and troubleshooting
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.O	describe requirements of designing or making a product or system.	Requirements are the criteria or expected outcomes we use when designing. For example, it is often impossible to make a product in a certain way because of the cost of materials or because of time constraints, such as needing the product to be made more quickly than is possible with the method in question. These limits are considered in making decisions about designing and making a product.	SPIKEEssential	Happy Traveler (3-5): Get Around Town Crazy Carnival Games (3-5): Creative Carnival Games Science Connections (G4): Information Transfer Science We Cannot See (G5): Energy Flow
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.P	evaluate the strengths and weaknesses of existing design solutions, including their own solutions.	Students can evaluate a range of potential solutions by analyzing their relative strengths and weaknesses. Using criteria and constraints, students acknowledge the limitations caused by one solution and continue to explore a range of ideas.	BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.Q	practice successful design skills.	Continued opportunities to experience and develop essential design skills will improve students' design experiences. Students engage in developmentally appropriate experiences to develop these essential skills, which will often be teacher-driven.	BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.R	apply tools, techniques, and materials in a safe manner as part of the design process.	Students understand that designers practice the making skills necessary to successfully complete a design. Continued opportunities to explore tools, techniques, and materials will result in refining the skills necessary to successfully design. Students can begin to select appropriate tools and materials for an identified purpose.	BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.S	illustrate that there are multiple approaches to design.	Design approaches are determined by the context, the individual, the available resources, and the intended purpose of the design.	BricQMotionEssential	ALL Lessons
						SPIKEEssential	ALL Lessons
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.T	apply universal principles and elements of design.	Students develop the necessary vocabulary to identify, describe, and begin to apply the principles and elements of design. Students can appreciate the impact of these principles and elements on design quality.	SPIKEEssential	Quirky Creations (3-5): Good Morning Machine Quirky Creations (3-5): Big Little Helper Quirky Creations (3-5): High-Tech Playground Quirky Creations (3-5): Trash Monster Machine Quirky Creations (3-5): Winning Goal Quirky Creations (3-5): Literary Randomizer Quirky Creations (3-5): Your School Creation
3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.U	evaluate designs based on criteria, constraints, and standards.	Students in this grade band develop an appropriate vocabulary to identify and discuss design parameters or requirements. They can recognize that purposeful design decisions are based on criteria and constraints.	SPIKEEssential	Happy Traveler (3-5): Get Around Town Crazy Carnival Games (3-5): Creative Carnival Games Quirky Creations (3-5): Your School Creation Animals and Their Environments (G3): Animals in Their Habitats Science Connections (G4): Information Transfer Science We Cannot See (G5): Energy Flow

3-5	Technology and Engineering	Design in Technology and Engineering Education	3.5.3-5.V	interpret how good design improves the human condition.	Students expand their scope of understanding by identifying wants and needs associated with the human condition beyond their immediate surroundings. Students recognize the potential impacts of design on the quality of life.	SPIKEEssential	Animals and Their Environments (G3): Preparing for the Weather Quirky Creations (3-5): High-Tech Playground Science We Cannot See (G5): Daytime and Nighttime Science Connections (G4): Prepare for Natural Hazards
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.W	describe the properties of different materials.	Students should understand the difference between natural and human-made materials and their basic properties. For example, wood, stone, metal, glass, and concrete are hard and dense; leather, paper, and some metals are flexible; glass and some plastics are transparent. Some materials conduct heat and electricity while others insulate to stop or delay transmission of heat or electricity. The properties of a specific material determine whether it is suitable for a given application.	SPIKEEssential	Science in Nature and Our Daily Life (G2): Classify and Choose Materials
3-5	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.3-5.X	explain how various relationships can exist between technology and engineering and other content areas.	Students can learn how to convert energy from the wind to power a motor or from acidic fruits such as oranges and grapefruits to energize an LED light. This type of project uses information from mathematics, science, and other fields to develop a deeper understanding among students about technology and engineering products and systems.	SPIKEEssential	Science Connections (G4): Energy Resources
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.Y	identify the resources needed to get a technical job done, such as people, materials, capital, tools, machines, knowledge, energy, and time.	Elementary students involved in problem-solving activities such as Odyssey of the Mind need to develop a list of resources that they will need for a play they must perform in front of judges. Strategic planning of resources might include the backdrop, costumes, props, what roles the team members will play, and a consideration of deadlines.		
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.Z	create a new product that improves someone's life.	Inventions are created to fulfill a human need or want. Inventions are the way that humans attempt to improve upon the natural world. Identifying various products that have helped people with disabilities, such as ITEEA's "Dream Ride GoBabyGo Style" initiative, is a good starting point for helping students find needs and consider innovative ways of	SPIKEEssential	Happy Traveler (3-5): Get Around Town Quirky Creations (3-5): Your School Creation
3-5	Technology and Engineering	History of Technology	3.5.3-5.AA	create representations of the tools people made, how they cultivated to provide food, made clothing, and built shelters to protect themselves.	Historical technological products and systems did not always work and often many attempts and variations were tested before an idea became a reality. For example, the development of pottery stretched over 10,000 years. People learned to mix various clays to make stronger items and they learned to fire pottery in ovens to harden the clay more quickly. Various containers, such as jugs, vases, and cups were designed and developed for holding things such as water, milk, seeds, and grains. Not all of the designs worked, and variations may be seen in every ancient civilization. Representations developed in		
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.BB	illustrate how, when parts of a system are missing, it may not work as planned.	A computer does not work when the power fails or when the battery has been removed.		
3-5	Technology and Engineering	Core Concepts of Technology and Engineering	3.5.3-5.CC	describe how a subsystem is a system that operates as a part of another larger system.	An example of a subsystem is the assemblage of water pipes in a house, which is part of a larger fresh-water distribution system in a town, city, or community.		
3-5	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.3-5.DD	demonstrate how simple technologies are often combined to form more complex systems.	Students could construct a small robot to demonstrate simple circuits using wires, a motor, and a power source (battery). Another example would be how an escalator uses the wheel and axle, inclined plane, pulley, gears, belts, and an electric motor to move people from one level to another.	BricQMotionEssential SPIKEEssential	ALL Lessons ALL Lessons
3-5	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.3-5.EE	explain how solutions to problems are shaped by economic, political, and cultural forces.	For example, the interests, desires, and financial resources of a group of people will influence the type of transportation system developed for that community. A transportation system for a large city may rely on mass transit, while one in a smaller town might rely on personal vehicles.	SPIKEEssential	Happy Traveler (3-5): River Ferry Happy Traveler (3-5): Taxi! Taxi! Happy Traveler (3-5): Hovering Helicopter Happy Traveler (3-5): Swamp Boat Happy Traveler (3-5): Cable Car Happy Traveler (3-5): Big Bus Happy Traveler (3-5): Get Around Town
3-5	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.3-5.FF	compare how things found in nature differ from things that are human-made, noting differences and similarities in how they are produced and used.	For example, the essentials for natural plant growth are sunshine (photosynthesis), air, water, and nutrients; whereas human-made items require an idea, resources (e.g., time, money, materials, and machines), and techniques. Things found in nature, such as trees, birds, and wildflowers, require no human intervention. On the other hand, creating human-made products, such as shoes, requires human effort and innovation.		
3-5	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.3-5.GG	describe the unique relationship between science and technology, and how the natural world can contribute to the human-made world to foster innovation.	People have, from the beginning, looked around to identify and use the materials and resources available to improve their lives. Raw materials and resources are shaped into tools, systems, and forms of energy to provide people with products that satisfy a need or want. Energy is harnessed to provide power and heat, and animals and crops are raised for food and clothing. These and other processes continue today as people use raw materials to create items they want and need.		
3-5	Technology and Engineering	Nature and Characteristics of Technology and	3.5.3-5.HH	differentiate between the role of scientists, engineers, technologists, and others in creating	The roles of scientists, engineers, and technologists are interrelated, yet each contributes a unique area of expertise to every endeavor. Students should be able to identify how		

	[illegible]	Engineering	[illegible]	[illegible] and maintaining technological systems.	individuals with different areas of content knowledge inform the creation of technology, and why this collaboration is important.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.A	research information from various sources to use and maintain technological products or systems.	Written and graphical information is helpful in learning how to use a product and determining if it works properly. In addition, many manuals provide tips on how to troubleshoot a product or system.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.B	use instruments to gather data on the performance of everyday products.	Students should use evidence to make more complex technology assessment decisions. For example, monitoring the power produced by a photovoltaic system will allow students to determine if the system is operating according to its rated output		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.C	hypothesize what alternative outcomes (individual, cultural, and/or environmental) might have resulted had a different technological solution been selected.	Development of technologies typically proceeds from a set of criteria identified through analysis of a need or want. Using specific technological examples, students can investigate the positive and negative outcomes of their use and consider how these outcomes could have been altered, given emphasis on different design criteria.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.D	analyze how the creation and use of technologies consumes renewable, non-renewable, and inexhaustible resources; creates waste; and may contribute to environmental challenges.	Building on students' knowledge about material resources and their growing understanding of sustainable resource use will provide opportunities for learning about methods of accessing resources (e.g., harvesting, mining, drilling) and the by-products of these activities.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.E	consider the impacts of a proposed or existing technology and devise strategies for reducing, reusing, and recycling waste caused by its creation.	Given specific examples in their home or community, middle grade students should be able to consider various options for minimizing or managing resource use (waste) and select or design practical strategies for waste reduction.	SPIKEPrime	Invention Squad (6-8): Super Cleanup
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.F	analyze examples of technologies that have changed the way people think, interact, live, and communicate.	At this age, students should be able to identify and discuss specific examples of technologies that have led to fundamental changes in humans. Obvious examples include things like social media and smartphones; students should be encouraged to dig deeper and identify less obvious technologies.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.G	analyze how an invention or innovation was influenced by the context and circumstances in which it is developed.	Characteristics of technologies are the result of the circumstances in which they are developed. Economic, political, cultural, and environmental drivers create historical contexts and determine the design of technology and its level of acceptance. For example, over the past decade, lighting technology has evolved considerably, with LED bulbs largely replacing both incandescent and compact fluorescent lighting as a result of people seeking more efficient, long-lasting, and more environmentally benign lighting solutions.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.H	evaluate trade-offs based on various perspectives as part of a decision process that recognizes the need for careful compromises among competing factors.	Technological developments come with both benefits and consequences. A trade-off is a compromise in which one thing is given up in order to get something else that is desired. Students should recognize that a society's expectation for new and unique products contributes to design for obsolescence and to unsustainable rates of consumption.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.I	examine the ways that technology can have both positive and negative effects at the same time.	The form and function of technologies are shaped by the criteria considered when the technology is developed. Even beneficial and well-intentioned solutions can have negative impacts. For example, flush toilets led to improved health and hygiene; at the same time, they created a need for water treatment strategies that consume large amounts of energy and fresh water. This type of example provides students an opportunity to consider the importance of design criteria.	SPIKEPrime	Prime Combined (6-8): Protect Our Produce
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.J	use tools, materials, and machines to safely diagnose, adjust, and repair systems.	For many consumer products, federal and state laws require safety information. Safety procedures should be learned through formal education and teacher demonstration. Tools are used by students for diagnosis, adjustments, and repair. For example, when the cutting bit on a computer numerically- controlled (CNC) lathe wears down, adjustments need to be made to the alignment of the cutting bit to the raw stock.	SPIKEPrime	Invention Squad (6-8): Broken
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.K	use devices to control technological systems.	Students should be familiar with and use sensors to control technological systems such as robotic devices, alternative energy vehicles, and other technologies. Many machines are equipped with other types of safety devices to protect the user.	SPIKEPrime	All Lessons
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.L	design methods to gather data about technological systems.	Examples include devices designed to test water or air quality, performance tests to assess things like accuracy or speed, destructive testing to analyze strength and durability of materials, and so on.	SPIKEPrime	Life Hacks (6-8): Rain or Shine? Life Hacks (6-8): Wind Speed
6-8	[illegible]	Applying, Maintaining, and Assessing Technological	[illegible]	develop a model to generate data for iterative testing and modification of a proposed object,	The iterative process of testing the most promising solutions and modifying what is [illegible]	BricQMotionPrime	All Lessons

	Technology and Engineering	Products and Systems		tool, or process such that an optimal design can be achieved.	proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	SPIKEPrime	All Lessons
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.N (	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.	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.O	interpret the accuracy of information collected.	Developing specific criteria for what information is useful is important in making these judgments. Sometimes determining accuracy is easy—taking information from physical measuring devices like a water- purity tester, for example. At other times, accuracy is more difficult to determine, as when assessments are based on public opinion, which can differ greatly from group to group.		
6-8	Technology and Engineering	Applying, Maintaining, and Assessing Technological Products and Systems	3.5.6-8.P (	evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.Q	apply a technology and engineering design thinking process.	Students intentionally use a technology and engineering design thinking process to iteratively solve design challenges. Students begin to recognize the value of revisiting steps in the design thinking process to avoid fixation on one solution.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.R	develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.	For example, the news is full of stories about young innovators such as Marie Elena Grimmett, who at age 14 developed a system for using recyclable plastic beads to filter out a harmful antibiotic used to treat livestock and commonly found in water supplies in rural areas. This development process entails the important step of problem finding, which often results from needs or wants that students have identified in their own lives or the lives of family members.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.S	illustrate the benefits and opportunities associated with different approaches to design.	A characteristic of design is weighing the benefits and opportunities associated with the approach a designer selects. It is important to consider these carefully when choosing the final approach to be selected in solving a problem.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.T	create solutions to problems by identifying and applying human factors in design.	Students acknowledge that the process of design is influenced by human factors and broaden their ability to identify and apply human factors such as ease of use and ergonomics.	SPIKEPrime	Invention Squad (6-8): Super Cleanup Invention Squad (6-8): Design for Someone
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.U	evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.	Students assess quality in designs based in part upon the principles and elements of design. With teacher guidance, students in this grade band can articulate reasons why they believe some designs are more effective than others.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.V	refine design solutions to address criteria and constraints.	Students design within provided criteria and constraints and recognize trade-offs associated with optimization.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons
6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.W (	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.	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful.	BricQMotionPrime	All Lessons
						SPIKEPrime	All Lessons

6-8	Technology and Engineering	Design Thinking in Technology and Engineering Education	3.5.6-8.X	defend decisions related to a design problem.	By requiring students to defend their actions and communicate their findings after attempting to solve a problem, students develop empathy, flexible thinking, accountability, and metacognition skills (i.e., awareness and understanding of their own thought processes). Helping students develop technology and engineering habits of mind involves the teacher explicitly modeling, teaching, and providing students with opportunities to demonstrate expected behaviors.	BricQMotionPrime SPIKEPrime	All Lessons All Lessons
6-8	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.6-8.Y	compare, contrast, and identify overlap between the contributions of science, technology, engineering, and mathematics in the development of technological systems.	Students at this level can discern the contributions the fields of science, engineering, mathematics, and technology (as well as other disciplines) contribute to the advancement of technological tools and systems. One way this can be accomplished is by evaluating a completed engineering design task and identifying the elements from other academic disciplines that contributed to the completion of the task.		
6-8	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.6-8.Z	analyze how different technological systems often interact with economic, environmental, and social systems.	For example, a navigation system in a delivery vehicle uses sensors that provide input to the distribution center and sends customers notifications when their products are delivered. If a package is delivered to a wrong address, GPS data can accurately determine the location to which the package was actually delivered.	SPIKEPrime	Invention Squad (6-8): Design for Someone Life Hacks (6-8): Rain or Shine? Life Hacks (6-8): Wind Speed Life Hacks (6-8): Veggie Love Training Trackers (6-8): Watch Your Steps
6-8	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.6-8.AA	adapt and apply an existing product, system, or process to solve a problem in a different setting.	Technology transfer is a creative way for people to address needs and wants. For instance, an automated pump based on biology laboratory designs was created for the Mars Viking space probe. The pump was modified for use as an insulin delivery mechanism, providing patients with a way to automatically regulate blood sugar. In classrooms, this concept is often already implicitly achieved as students apply existing technologies in novel ways. An example that may be highlighted is the use of a microcontroller to solve a design problem.		
6-8	Technology and Engineering	Integration of Knowledge, Technologies, and Practices	3.5.6-8.BB	demonstrate how knowledge gained from other content areas affects the development of technological products and systems.	Skills learned in fine arts are used in designing and rendering examples of technological products and systems. Studying the history of technology and engineering provides people with a way to learn from past successes and challenges. A tangible example can be seen as students demonstrate an applied knowledge of Newton's Laws of Motion in the construction, testing, and evaluation of roller coasters, rockets, or dragsters.		
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.CC	consider historical factors that have contributed to the development of technologies and human progress.	For example, students can examine maps in a historical context and decipher how geography and availability of natural resources often determined the materials humans used for shelter.		
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.DD	engage in a research and development process to simulate how inventions and innovations have evolved through systematic tests and refinements.	For example, in 1879 the first light bulb burned for only 13 hours. Since that time there have been many innovations and design changes to Edison's light bulb. Students can research the timeline of a given technology, noting the significant changes and what those changes have meant to society and the environment.		
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.EE	differentiate between inputs, processes, outputs, and feedback in technological systems.	Inputs consist of the resources that flow into a technological system. The processes are the systematic sequences of actions that combine resources to produce an output, encoding, reproducing, designing, assembling, or propagating, for example. The output is the result, which can have both positive or negative impacts. Feedback is information used to monitor or control a system. A system often includes a component that permits revising or refining the system when the feedback suggests such action. For example, the fuel level indicator of a vehicle is a feedback system that lets the user know when the system needs additional fuel.	SPIKEPrime	Invention Squad (6-8): Help! Kickstart a Business (6-8): Place Your Order Kickstart a Business (6-8): Out of Order Kickstart a Business (6-8): Keep It Safe Kickstart a Business (6-8): Keep It Really Safe! Kickstart a Business (6-8): Automate It! Life Hacks (6-8): Rain or Shine? Life Hacks (6-8): Wind Speed Life Hacks (6-8): Veggie Love Training Trackers (6-8): Stretch with Data Training Trackers (6-8): Watch Your Steps
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.FF	demonstrate how systems thinking involves considering relationships between every part, as well as how the systems interact with the environment in which it is used.	Systems are used in a number of ways. Systems also appear in many aspects of daily life, such as communication systems and transportation systems. Analyzing a system is done in terms of its individual parts or in terms of the whole system and how it interacts with or relates to other systems. For example, discussing a computer system may involve the particular parts of a single computer, or it may include an entire computer network. Discussing a transportation system may involve listing the various parts of a particular form of transport (e.g., airports, airplanes, air traffic control, airport security, etc.), or it may be discussed by comparing the overall attributes of one type of transportation system to another (e.g., the type of vehicles used, energy inputs, control mechanisms, and so on).		

6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.GG	create an open-loop system that has no feedback path and requires human intervention.	An example of an open-loop system is a light switch in a room. The electrical system has no feedback loop but requires someone to flip the switch (input) to send electrons to the bulb (process) and make light illuminate the room (output).	SPIKEPrime	Invention Squad (6-8): Help! Kickstart a Business (6-8): Place Your Order Kickstart a Business (6-8): Out of Order Kickstart a Business (6-8): Automate It!
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.HH	create a closed-loop system that has a feedback path and requires no human intervention.	Systems can be designed to utilize automated controls that both receive information from the system and take action based on the content of that feedback. An example is the water heater in a home, which has a thermostat to provide feedback and automatically adjusts the system when it needs to be turned on and off.	SPIKEPrime	Supplementary Lessons (6-8): Going the Distance
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.II	predict outcomes of a future product or system at the beginning of the design process.	Careful designers consider possible outcomes of a technological product before the product is completed. This is a habit of mind that students should continually expand through design, problem solving, ideation, and systems thinking.		
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.JJ	apply informed problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.	Design and problem -solving are seen as iterative processes that involve idea generating, making or building possible solutions, testing, and redesign. Creative problem-solving allows for new insights that lead to improvements such as greater efficiency, better performance, lower environmental impacts, and so on. For example, students learning about aerodynamics might devise modifications to a model rocket design to make it more streamlined and accurate.	SPIKEPrime	Most SPIKE Prime Lessons focus on solving a need or problem Most SPIKE Prime Lessons focus on solving a need or problem where an initial model is improved
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.KK	explain how technology and engineering are closely linked to creativity, which can result in both intended and unintended innovations.	Creativity requires an individual to use knowledge and experience from different subjects to create something new or to use something in a new way. Many inventions are inspired by perceived needs and wants—the toothbrush, for example. At other times, inventions emerge in unexpected ways. For example, Stephanie Kwolek was working to find a replacement for steel cords in tires when she inadvertently invented Kevlar. Creatively exploring new ideas is often key to improvement of technological products and systems.	SPIKEPrime	Most SPIKE Prime Lessons focus on solving a need or problem
6-8	Technology and Engineering	Nature and Characteristics of Technology and Engineering	3.5.6-8.LL	compare how different technologies involve different sets of processes.	For example, data processing includes designing, summarizing, storing, retrieving, reproducing, evaluating, and communicating information. The processes of construction include designing, developing, evaluating, making and producing, marketing, and managing.	SPIKEPrime	Practiced in most SPIKE Prime Lessons