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Sphero: A Blueprint For STEAM!

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Sample Florida Common Core/CTE Standards

08.02 Use career resources to develop an information base that reflects local and global business-related occupations and opportunities for continuing education and workplace experience.

08.04 Design, initiate, refine, and implement a plan to facilitate growth and skill development related to anticipated job requirements and career expectations.

08.06 Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals.

LAFS.910.RI.4.1 & LAFS.910.SL.1.2

By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

LAFS.1112.RI.4.1 & LAFS.1112.SL.1.2

By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.

By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

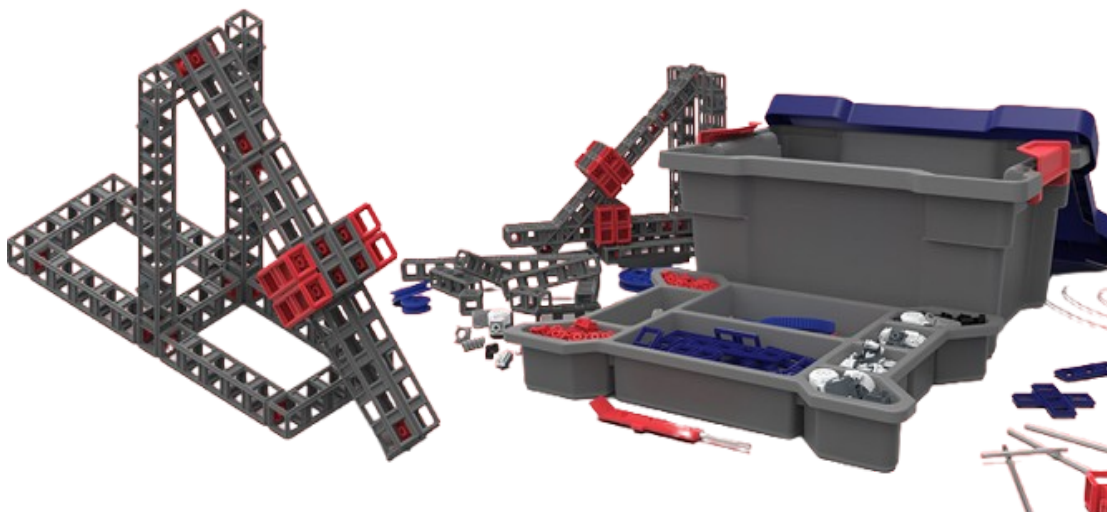
Disclaimer/Notation: The above standards are specific to 9th, 10th, 11th, and 12th grades; however, this project meets standards for all grade levels (K-12) in reading/language arts, social studies, visual arts, and many other content areas that integrate to a STEAM initiative. A multitude of Common Core standards are easily met across the curriculum using the following plans and lesson ideas.

Goals & Objectives

Through engaging with the Sphero Blueprint Engineering Kit, students in the classroom will be introduced to fundamental engineering principles, problem-solving strategies, and design thinking. The overarching goal is to provide hands-on learning experiences that empower students to explore the core concepts of engineering through the accessible and engaging snappable building system. These activities will foster creativity and collaborative learning, laying a foundational understanding of how objects are designed, built, and tested.

Upon utilizing the Sphero Blueprint Engineering Kit, students will be able to identify the various components of the kit and understand their basic functions within a structural context. They will gain practical experience in constructing simple structures, such as towers and bridges, learning to adhere to specific design constraints and evaluate their stability. Furthermore, students will develop the ability to iteratively design and refine their creations based on testing outcomes, understanding that engineering is a process of continuous improvement.

Ultimately, these classroom activities aim to inspire students to become innovative thinkers and effective problem-solvers. By actively working with the Sphero Blueprint Engineering Kit, students will tangibly explore concepts such as structural integrity, load bearing, and material properties. This hands-on approach is designed to cultivate critical thinking, teamwork, and an early, practical appreciation for the engineering design process among K-12 students.

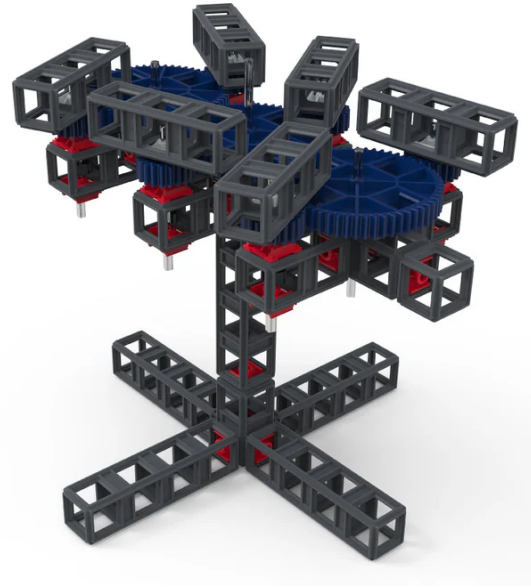
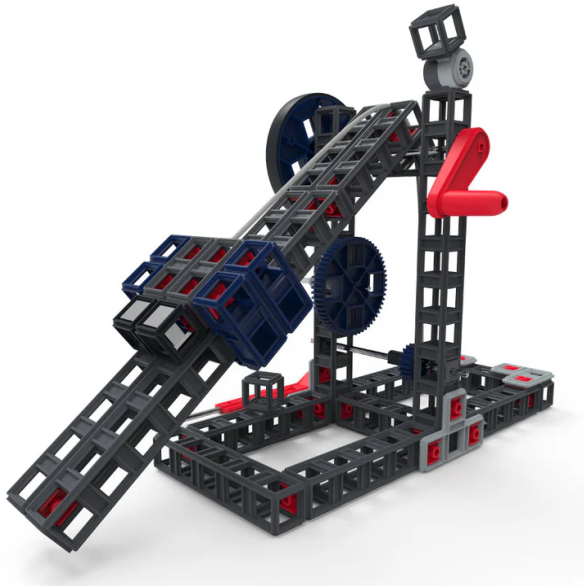


Project Overview

This section introduces a practical, ready-to-implement project designed to immediately engage students with the Sphero Blueprint Engineering Kit: "The Resilient Structure Challenge." This hands-on activity invites students to design, build, and test a structure, such as a bridge or a tower, capable of withstanding various "environmental" stressors like simulated wind from a fan or the incremental addition of weight. The challenge is intentionally open-ended, allowing for diverse student solutions and sparking immense creativity, while still providing clear structural goals. This adaptability makes it supremely suitable for engaging learners across all K-12 grade levels, from elementary explorations of stability to more complex middle school investigations into material properties and load bearing.

The "Resilient Structure Challenge" is meticulously crafted to pique intrinsic interest in STEM by allowing students to directly experience the dynamic, iterative design process inherent in true engineering. From the initial brainstorming sessions where ideas are sketched and debated, through the hands-on building phase, to the exhilarating (and sometimes humbling) final testing, students will collaborate, problem-solve, and witness their innovative ideas come to life – or, crucially, learn from their structures' collapses, prompting valuable redesigns and deeper understanding. This direct engagement helps demystify complex engineering concepts, transforming abstract ideas into tangible successes and powerful learning opportunities that foster a genuine curiosity for how things work.

Through active participation in this immersive challenge, students will gain a deeper, practical understanding of real-world engineering principles that extend far beyond the classroom. They will instinctively explore how factors like structural integrity, efficient material distribution, proper bracing techniques, and the choice of connection points profoundly influence a design's overall strength and stability. These experiences directly mirror the critical considerations faced daily by professional engineers, architects, and roboticists in their own work. This foundational experience with the Sphero Blueprint Engineering Kit serves as an excellent and highly engaging stepping stone, clearly demonstrating the immediate and exciting application of STEM concepts and inspiring students towards future exploration into higher-level robotics and engineering fields.

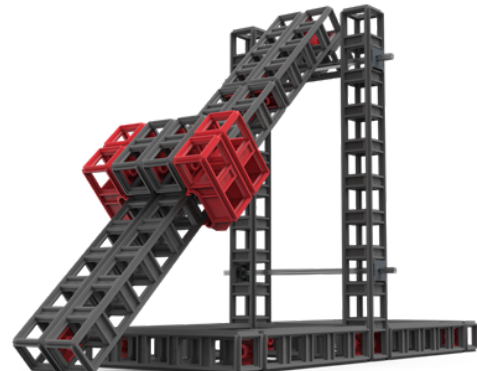
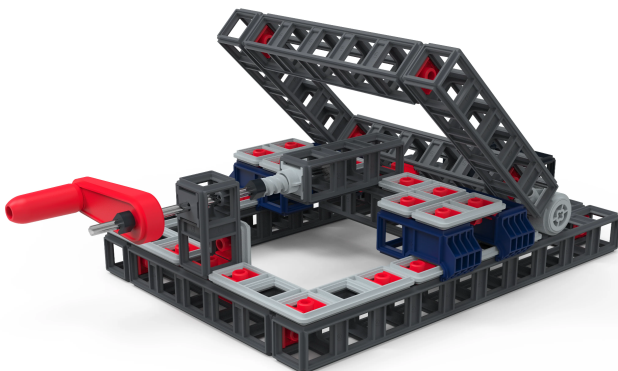


Step-By-Step Lesson Plan/Guide (For Teachers)

- 1) As educators, we can appreciate that many of our students will readily grasp building concepts, while others may find the initial structural challenges more demanding. Just like any assignment, there will be students who excel quickly, and others who will benefit from a supportive boost to begin and successfully complete their projects. We also recognize that some students may possess an intuitive understanding of physical construction or have prior experience with similar building toys, which can be leveraged. This often leads to natural student leaders emerging within the lab setting, ready to assist their peers – a truly valuable dynamic!
- 2) On Day one (or one class period), invite your students/classes to unpack all components of the Sphero Blueprint Engineering Kit. Encourage them to explore the various snappable pieces, connectors, and wheels. Facilitate a discussion around what they observe, what they imagine they could build, and any initial questions they may have about the kit's parts or their function. Sometimes, the less a student initially understands about a project, the greater the potential for profound growth and discovery throughout the hands-on process.
- 3) On Day two (or one class period), once all students have had a chance to explore the physical components and pose their questions, it's an opportune time to introduce the "Resilient Structure Challenge" as discussed in the project overview. This is where students will begin to work

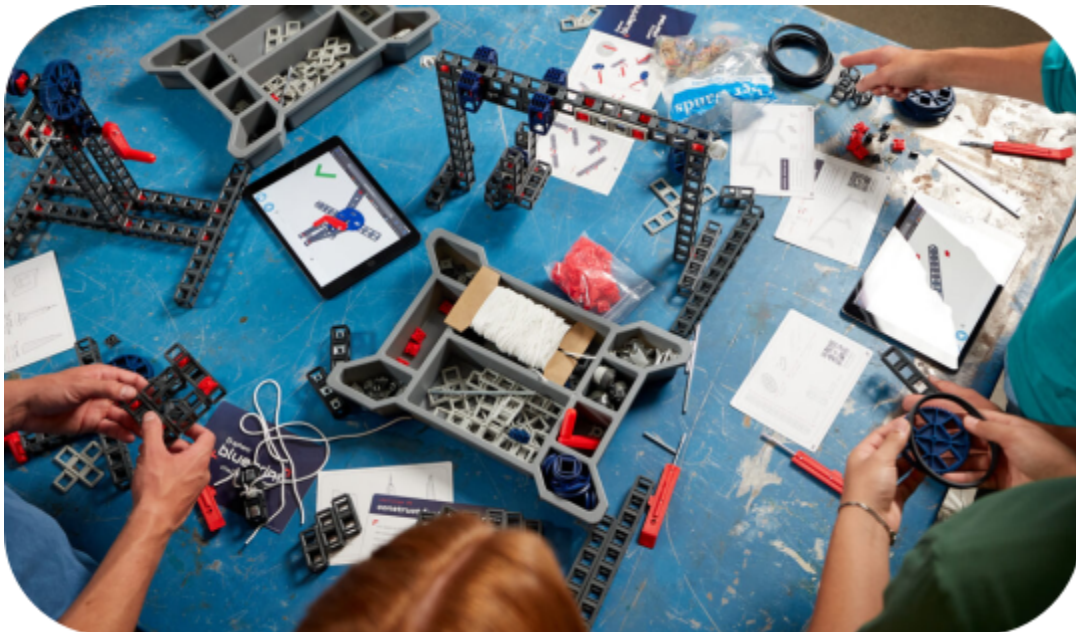
in a safe "sandbox" environment, as the physical kit allows for easy assembly and disassembly without fear of breakage, promoting uninhibited experimentation. Encourage them to start with basic structures like simple towers or bridges, focusing on stability and fundamental design. Students will be able to translate their initial ideas into tangible constructions, testing basic principles of balance and support.

- 4) On Day three (or one class period), once students have constructed their initial designs, it's time to test their resilience and physically refine their projects. Students will apply "environmental" stressors, such as simulated wind (e.g., from a small fan) or the gradual addition of weight, to their structures. This will be an incredible opportunity for students to analyze why designs succeed or fail, and to iterate on their builds. This timeframe will vary for each student group, as each project and its inherent challenges will lead to unique design refinements. This phase fosters amazing growth, allowing students to see each other actively engaging with real-world engineering applications, much like designing a stable bridge or a wind-resistant building. Teachers do not need to be structural engineering experts; the process itself will guide much of the learning!
- 5) After students have exhausted multiple iterations and activities, they will naturally want to research and gain ideas on how these foundational engineering concepts can be applied to their everyday lives; the sky is truly the limit! Encourage students to document their ideas, design choices, and testing results in a journal or digital document, fulfilling your specific assignment/project submission requirements. A final summary from each student or small group could then take place through various mediums, such as individual presentations to showcase their findings, a short movie with photos of their design process, or even a simple design report. The possibilities for project demonstration are endless, and each student's outcome will be wonderfully unique.



How-To Guide (For Students)

- Welcome to your Sphero Blueprint Engineering Challenge! Get ready to become a real engineer. On Day 1, you'll start by opening your Sphero Blueprint Engineering Kit. Take out all the snappable pieces, connectors, and wheels. Explore them, snap them together, and see what shapes you can make. Think about what you could build and ask any questions you have about the different parts. Don't worry if you don't understand everything at first – that's part of the exciting learning process!
- On Day 2, we'll dive into the "Resilient Structure Challenge." Your mission is to design and build a structure, like a mini bridge or a tall tower, that can stand strong against challenges. This is your chance to experiment freely; the kit is made for snapping pieces together and taking them apart easily, so don't be afraid to try out all your ideas! Begin with simple designs, focusing on making your structure stable and balanced. You'll be bringing your ideas from your imagination right into a physical creation.
- Finally, on Day 3, it's time to put your creation to the test! We'll apply "environmental stressors" to your structure, such as a gentle breeze from a fan or slowly adding small weights. Watch how your design holds up! If it doesn't quite work as planned, that's okay – every engineer learns from challenges. This is your chance to make improvements, redesign, and try again. You'll see how real-world structures are built and tested, and you'll discover how strong and creative you can be!



Sample Project Scoring Rubric

<u>Category</u>	<u>Points Possible</u>	<u>Excellent (Above & Beyond)</u>	<u>Very Good (80%)</u>	<u>Good (70%)</u>	<u>Fair (65%)</u>	<u>Points Received</u>
<u>Component Exploration & Understanding</u> (The student actively engaged in exploring kit components and demonstrated basic understanding of their function.)	30	25-30 Points	20-24 Points	15-19 Points	0-14 Points	
<u>Design & Construction</u> (The student successfully designed and constructed a structure, showing attention to stability and balance.)	30	25-30 Points	20-24 Points	15-19 Points	0-14 Points	
<u>Testing & Iteration</u> (The student effectively tested their structure, analyzed results, and made meaningful improvements based on observations.)	30	15-20 Points	10-14 Points	5-9 Points	0-4 Points	
<u>Effort/Engagement</u> (The student demonstrated consistent effort, participated actively, and showed enthusiasm throughout the challenge.)	10	15-20 Points	10-14 Points	5-9 Points	0-4 Points	
Total Possible:	100	80-100	60-79	40-59	0-39	
Grade Equivalent:	A+	A	B	C	D	



Websites/Learning Ideas/Resources

Sphero Official Website (Blueprint Section):

- URL: <https://sphero.com/products/sphero-blueprint-build-kit>
- *Why it's great:* This is the most direct source for information about the kit itself, often including educator guides, lesson plans, and detailed product specifications that can inform student projects. They also have various class packs with accompanying lessons.

Science Buddies (Engineering Challenges):

- URL: <https://www.sciencebuddies.org/blog/teach-engineering-design-process>
(Look for their broader engineering project section)
- *Why it's great:* Science Buddies offers an array of STEM project ideas, many involve engineering design challenges. Students can find inspiration for different types of structures or mechanisms that could be adapted using the Sphero Blueprint kit.

DiscoverE (Grades 6-8 Engineering & STEM Activities):

- URL: <https://discovere.org/student-activities/grades/grade-6-8/>
- *Why it's great:* This site provides activities specifically designed for middle school students, focusing on applying engineering principles through hands-on projects and collaborative learning, which aligns perfectly with the Blueprint kit's purpose.

PBS KIDS for Parents (Let's Build! Help Your Child Develop STEM):

- URL: <https://www.pbs.org/parents/lets-build>
- *Why it's great:* While aimed at a slightly younger audience, the concepts of stability, balance, and problem-solving through building are universal. It provides excellent prompts for discussion and initial building ideas that can easily scale up for middle schoolers using the Blueprint kit.

Veritas AI (15 Engineering Projects For Middle School Students):

- URL: <https://www.veritasai.com/veritasaiblog/https://wwwveritasaicom15-engineering-projects-for-middle-school-students>
- *Why it's great:* This list offers specific project ideas that can inspire how students use the Sphero Blueprint kit, such as building simple machines or eco-friendly models, providing a concrete starting point for their designs.

Little Bins for Little Hands (Simple Machine Projects):

- URL: <https://littlebinsforlittlehands.com/simple-machine-projects/>
- *Why it's great:* This resource, while also having content for younger kids, contains excellent ideas for building simple machines (levers, pulleys, inclined planes) which can be directly explored and constructed with the Sphero Blueprint components, providing a strong connection to physics concepts.

Khan Academy (Science & Engineering):

- URL: <https://www.khanacademy.org/science/engineering>
- *Why it's great:* While not hands-on building activities, Khan Academy offers in-depth explanations of scientific and engineering principles (e.g., forces, motion, structural integrity) that directly underpin the challenges students will face with the Blueprint kit, helping them understand the "why" behind their designs.

NASA STEM:

- URL: <https://www.nasa.gov/stem/>
- *Why it's great:* NASA offers a wealth of STEM resources. While perhaps more advanced, students can explore real-world engineering challenges related to space exploration, inspiring them to think about how their smaller-scale Blueprint projects connect to larger, more complex engineering feats.

EngineerGirl:

- URL: <https://www.engineergirl.org/>
- *Why it's great:* A fantastic resource for all students, particularly encouraging girls in engineering. It features profiles of engineers, engineering challenges, and information about various engineering fields, helping students see the broader context and career possibilities of their Blueprint activities.

Exploratorium (Science Snacks & Activities):

- URL: <https://www.exploratorium.edu/snacks>
- *Why it's great:* The Exploratorium offers "Science Snacks" – simple, hands-on activities that demonstrate scientific principles. Many of these can inspire miniature engineering problems or provide a deeper understanding of the physics at play when building with the Sphero Blueprint kit.



Project Kit Resource Samples / Student Work Samples





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