Sphero Edu

TEACHER RESOURCE GUIDE

England's Curriculum for Excellence Benchmark Integration

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Introduction to Sphero Edu

Sphero Edu provides a toolset that is unbounded in its potential. Our program goes beyond code by incorporating robotics and the technologies with collaborative STEAM activities, nurturing students' imaginations in ways no other education program can. So, what can you do with Sphero in education? Although the possibilities are endless, below are some ideas of how you could integrate Sphero into your educational setting:

- Teach computational thinking by programming Sphero robots in three different ways designed for learner progression - draw, blocks, and Javascript. Coding comes to life with Sphero!
- Measure time, speed, distance and other metrics to complete real world experiments
- Perform specific functions such as motion and direction, color and light, and sensor-controlled reactions
- Direct the movement of Sphero robots using an app or autonomously using code to navigate a maze
- Problem solve, collaborate, and iterate!

Sphero is adaptable to all ages, skill levels, and content areas. The Teacher Resource Guide is designed to give you everything you need to know to get the ball rolling with your students.

Mission in Education

Sphero Edu provides a toolset that is unbounded in its potential. While coding and 21st century skills are necessary, our program also goes beyond code by incorporating robotics and technology with collaborative STEAM activities, nurturing students' imaginations in ways no other education program can.

How are Sphero Robots Being Used in Education?

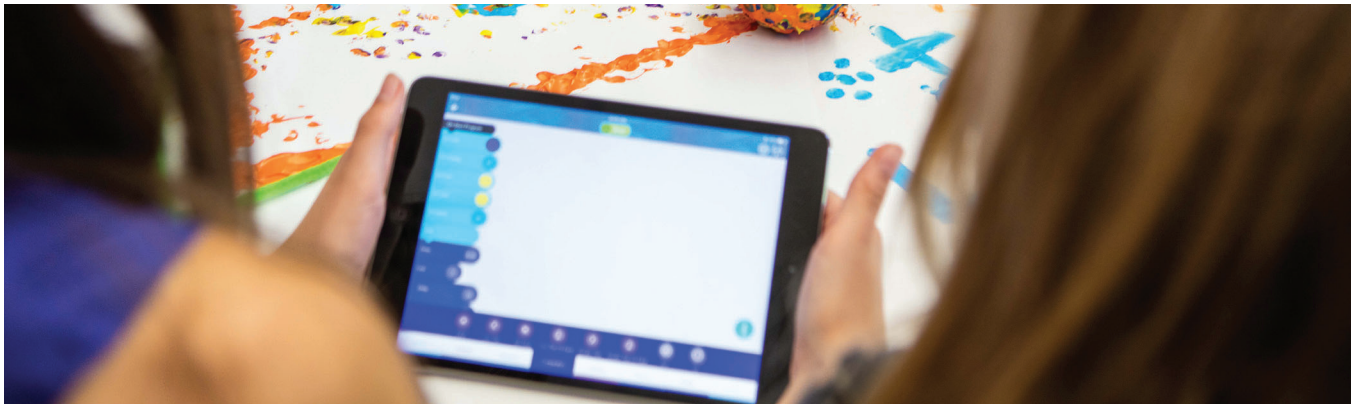
Sphero can be used in and out of the classroom in formal and informal learning environments. Below are some ways Sphero is being used in different situations:

Primary, Secondary and Home Education

In classrooms and home education learning environments, Sphero is being used to teach computer science concepts and to supplement various content areas (mathematics, languages, sciences, art, music, health education, and more). Sphero is incredibly versatile and easily integrated into a variety of learning initiatives including personalized learning and project-based learning.

Sphero Edu offers three different coding "canvases" - Draw, Block, and Text - that move from beginner to advanced coding skills, making it simple to use with learners of all ability levels, from primary to secondary school and special education. Students can work collaboratively or at their own pace thanks to the Sphero Edu app.

Introduction to Sphero Edu



Primary

Primary aged students are grasping early concepts of programming while fostering 21st century skills through activities such as replicating the solar system, programming characters in a story, or painting geometric shapes with the robot. Students are exposed to real world problems and the 4C's (collaboration, communication, creativity, and critical thinking).

Secondary

Secondary school aged students explore advanced concepts of logic, design thinking, and computer science. Students use the more complex variables, sensors, and text programming of Sphero to take programming to the next level and learn the foundations of JavaScript.

Higher Education

In higher education and post-secondary learning environments, learners are using Sphero to provide a hands-on method to learn the programming language JavaScript and advanced coding skills. Sphero's built-in sensors are also used to measure forces and gather data, such as acceleration, velocity, and pitch, during scientific experiments.

Clubs

Sphero is being used in robotics, coding, and STEM clubs that may meet before/after school or during lunch. Clubs can be an effective way to attract students, especially underrepresented groups, to participate in STEAM-based learning activities and creative challenges.

Introduction to Sphero Edu

Competitions

The hands-on nature of Sphero makes it the perfect tool for competitions. Competitions are a great way to bring younger and older students together. Kids can complete engineering challenges, program robots, and compete against peers.
Think beyond formal competitions and organise a competition for your school such as Sphero Olympics, STEAM Night, or Evening of Code.

Makerspaces

Makerspaces are being implemented in schools everywhere, especially library programs, to encourage creativity, innovation, and hands-on learning. Sphero is the perfect addition to makerspaces, giving students an opportunity to learn by doing, tinker with robotics, and experiment with open-ended programming challenges. Refer to the Makerspace Guide for tips on bringing Sphero into a makerspace.

Why is Sphero Edu a Valuable Educational Tool?

Learning in Computing Programmes of Study

England has a strong tradition of excellence and innovation in technological research. This is especially true in areas such as engineering, electronics, optoelectronics, biomedical research, genomics and cell engineering. Students need to be skilled in technologies and to be aware of the impact of technologies on society and the environment, now and in the future.
The computing programmes of study framework offers challenging activities which involve understanding and applying the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation, analysing problems in computational terms and evaluating and applying information technology, including new or unfamiliar technologies, analytically to solve problems and the rewarding learning which often results from creating products which have real applications. Sphero allows for progression in cognitive skills. Students will develop their creativity and computational skills and be encouraged to become innovative and critical designers of the future.

Why is Sphero Edu a Valuable Educational Tool?

Purposes of computing programmes of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims:

The national curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology

Why is Sphero Edu a Valuable Educational Tool?

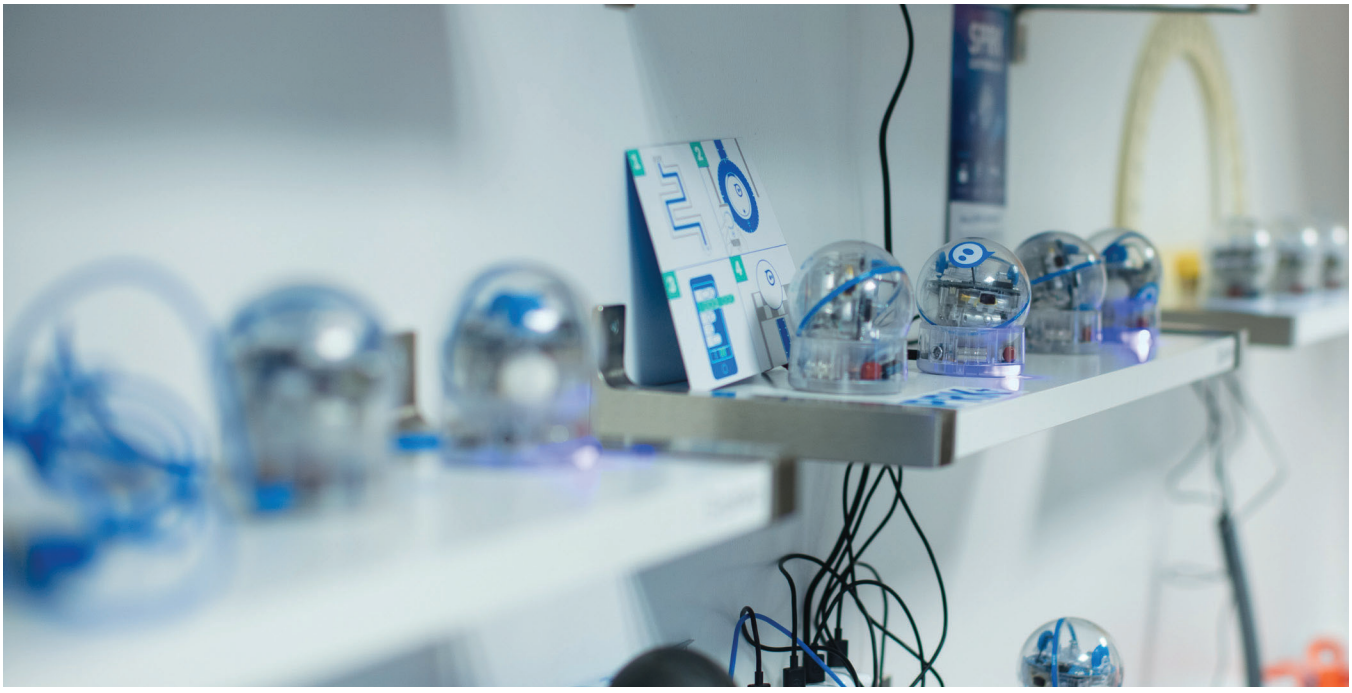
Skills Developed in Computing Programmes Study

The Computing Programmes Study provides frequent opportunities for active learning in creative and work related contexts, thus provides opportunities to continually develop, use and extend skills that are essential components for life, work and learning, now and in the future, including planning and organisational skills.

Educational Value and Alignment to Outcomes

Sphero can be used to teach computer science concepts and/or supplement content in any curriculum area. Sphero provides extensive learning activities that are aligned to literacy, numeracy, and health and wellbeing across learning.

Teachers don't have to be programming experts to integrate Sphero into their classroom instruction. Sphero Edu offers three different coding "canvases" - Draw, Block, and Text - that move from beginner to advanced coding skills. The three coding canvases help teachers to target learner abilities and even differentiate learning. These three coding options make it easy for teachers to use Sphero with students of all ages and abilities. Teachers do not need additional resources or activities to use these different canvases – the same Sphero used in an early primary grade classroom can also be used in secondary.



Why is Sphero Edu a Valuable Educational Tool?

STEAM Education

Sphero robots provide real life learning to science, technology, engineering, art, and math. A few examples of the STEAM integrations built into the Sphero Edu learning activities are:

- Build a bridge and drive a Sphero robot across to test the structural integrity
- Create a long-exposure photograph
- Learn the math and science behind Olympic sports to maximize a Sphero robot's long jump distance

In addition to the learning activities provided by Sphero, review the resources below for some ideas for integrating Sphero into STEAM education:

- Teaching Physics with Sphero Robots
- How to Use Sphero the Robot for Incredible STEM Lessons

Project Based Learning (PBL)

It is easy to expand your Sphero learning activities into PBL or include Sphero robots as a part of PBL. Are you new to PBL? Visit the Buck Institute for Education website to learn more and find a variety of resources including planning documents and rubrics:

- Buck Institute for Education
- Buck Institute for Education Essential Project Design Elements

Personalised Learning

Goals, content, method and pace can all vary in a personalised learning environment. The hands-on nature of Sphero makes it a perfect tool to tailor to the preferences, interests and pace of various learners. Review these resources to learn more about personalised learning:

- Personalised vs Differentiated vs Individualised Learning
- 3 Ways to Personalise the Learning Experience

Why is Sphero Edu a Valuable Educational Tool?

Computational Thinking

Sphero is the perfect platform to help students develop computational thinking skills and the mindsets that are necessary to compete in a global, technology-rich economy.

Sphero serves as both a coding platform and self-contained robotics system that can be used by any teacher or student, without any background in computer science. In addition, Sphero robots have a sophisticated set of sensors (called an inertial measurement unit or IMU) used for measuring forces and gathering data during scientific experiments.

Here are some examples of how Sphero activities help build a computational thinking mindset, with or without writing code.

Computational Thinking Fundamentals	What This Means	Examples in Sphero Activities
Decomposition	Does the activity encourage the student to break a larger problem into smaller problems to come up with a solution?	Students solve complex problems through smaller, more manageable tasks.
Pattern Recognition	Does the activity encourage the student to identify common patterns?	Students identify common patterns like movement, speed, light, time, or direction of the robot.
Pattern Generalisation and Abstraction	Does the activity encourage the student to make connection about common patterns?	Students connect concepts, such as speed & direction to how far the robot traveled.
Algorithm Design	Does the activity encourage the student to create logical steps that can be automated based on those patterns and connections?	Students create programs to control the Sphero robot. These often require using patterns like loops, which can be used to automate repeated behavior.

Why is Sphero Edu a Valuable Educational Tool?

Explore the following computational thinking resources for more ideas:

- ISTE's Computational Thinking Toolkit
- Hour of Code Activities - Use Sphero robots to make hour of code activities come to life!

21st Century Skills

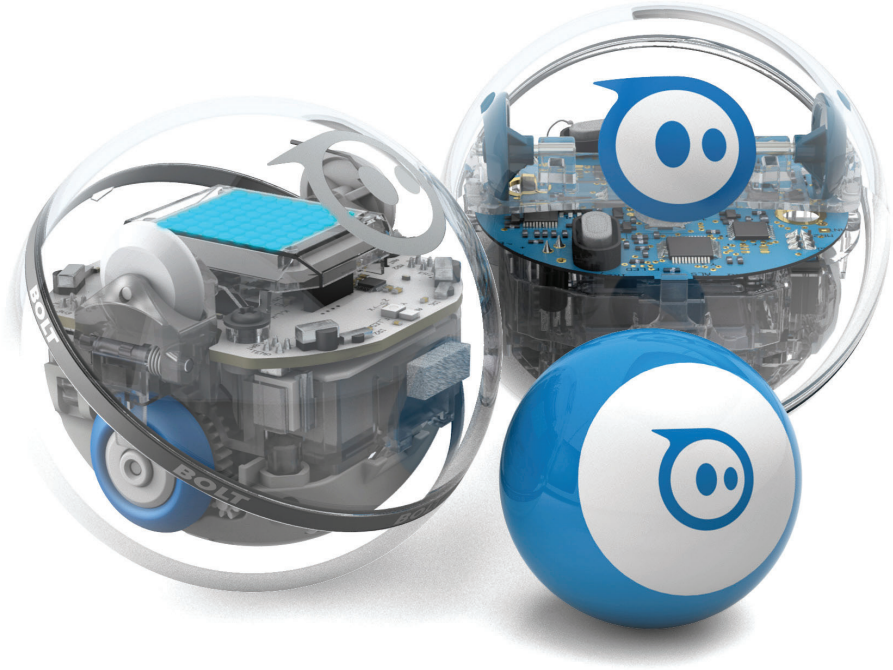
Sphero is the perfect platform to help students develop the mindsets that are necessary to compete in a global, technology-rich 21st century economy. Integrating Sphero into learning activities provides an opportunity to enhance 21st century skills such as creativity, collaboration, critical-thinking, and communication. The Sphero Edu App allows collaboration with other users around the globe to innovate the world of education and empower anyone to program. Refer to the Framework for 21st Century Learning for more information and definitions of 21st century skills.

Why BOLT?

Englands's Computing Programmes of Study outcomes and experiences are designed to tap into children's and young people's natural inven-tiveness and their desire to create and work in practical ways. Sphero Bolt's features provide a new wave of opportunities for teachers and students to developing skills, knowledge, understanding and attitudes, and so maximise achievement. Well-designed activities which utilise the added features of Sphero Bolt offer children and young people opportunities to develop:

- Curiosity and problem-solving skills, a capacity to work with others and take initiative
- Planning and organisational skills in a range of contexts
- Creativity and innovation, for example though ICT and computer aided design and manufacturing approaches
- Skills in using tools, equipment, software and materials
- Skills in collaborating, leading and interacting with others
- Critical thinking through exploration and discovery within a range of learning contexts
- Discussion and debate
- Searching and retrieving information to inform thinking within diverse learning contexts
- Making connections between specialist skills developed within learning and skills for work
- Evaluating products, systems and services
- Presentation skills

Get to Know Your Robot



Inside the Robot

Sphero robots are approachable and simple to use, yet are packed with incredibly complex tech. Here's the gist of the magic inside your ball:

- **Circuit board** - The printed circuit board (or PCB) is what houses all of the electronics in your robot that process commands into actions. A Bluetooth chip within that board connects to your device, receives your commands, and sends them to the IMU, or the robot's brain, to process. Also built into the circuit board are the gyroscope and accelerometer, which detect your robot's movements, acceleration, and turning, helping to keep it oriented and driving where you tell it to drive. BOLT introduces an additional ambient light sensor that measures light intensit; a magnetometer (digital compass); infrared emitters and receivers for BOLT to BOLT communication, following, and evading; and a gorgeous 8x8 LED matrix that allows for custom images and animations.
- **Electric motor** - An electric motor turns the wheels that move your Sphero robot while the pressure from a stabilizer on top allow the wheels to move your robot, keeping it from going in circles inside the ball.
- **Charger** - To keep the Sphero robot's tech sealed inside its shell, it uses inductive charging rather than wiring to the batteries inside. Place it on the base and it'll charge right through the polycarbonate.

Get to Know Your Robot

Compatible Devices

Sphero robots must have an accompanying device to operate the robots. Here are some tips regarding these devices:

- A list of compatible devices for each robot type may be found at https://www.sphero.com/devices.
- Chromebooks, macOS, and Windows 10 devices are now supported by Sphero Edu.
- The larger the screen, the better.
- If you are in need of mobile devices to run your Sphero robots, retired smartphones work great.
- Consider asking for old smartphone donations from your community.
- Remember to keep the mobile devices updated.
- Remember to keep the Sphero Edu app and other Sphero-related apps you may be using on the mobile devices updated.

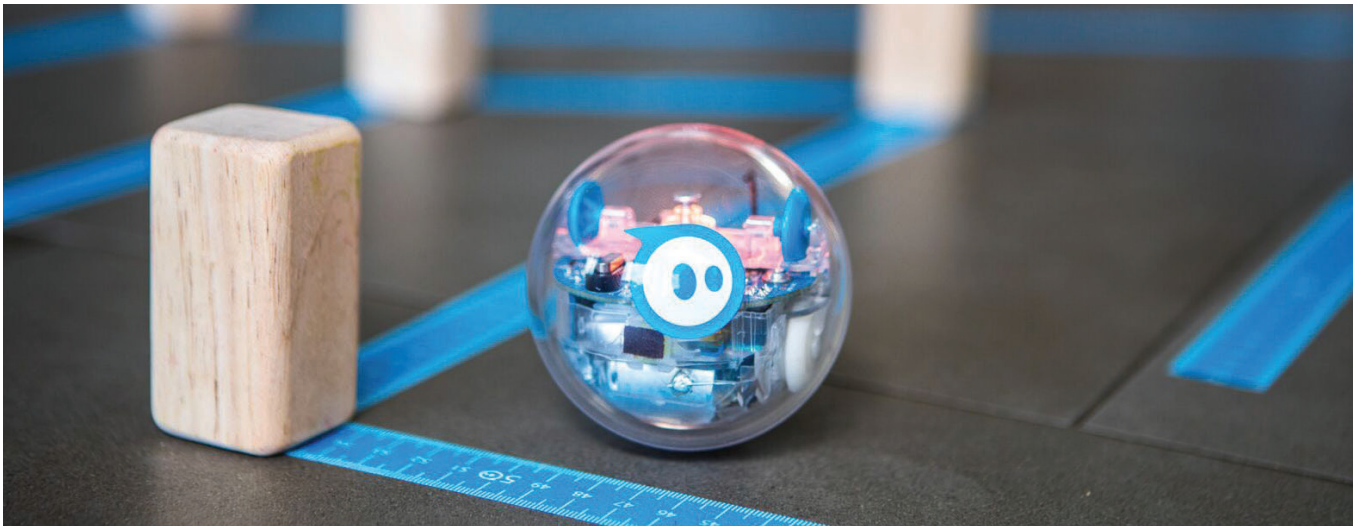
Charging

Follow these tips to get the longest battery life out of your Sphero robot!

- How to charge your Sphero robots:
    - Sphero robots charge via Micro-USB cables and dedicated AC wall plugs. Computers can be used to charge Sphero robots as well but typically this will increase charging time due to the lower voltage output of a computer USB port.
    - Place the Sphero robot on the charging cradle heavy side down. Sphero robots will not charge if they are not placed heavy side down in the charger. Ensure students know how to place robots in the charger.
    - Plug power cord into a wall outlet. The blinking blue charger lights indicate the Sphero robot is charging.
        - If students are placing Sphero robots in the chargers, check at the end of class for the blue blinking light.
    - Charge for 3 hours or until the blue charger light stops blinking. It is OK to keep Sphero robots on the charger for longer. Remove robots from the cradle to get the party started.
- Make sure to charge your Sphero robots and mobile devices the night before use.
- Battery life slightly varies depending upon the specific robot. SPRK+ and Mini will give you around an hour of play, while BOLT is ready for over 2 hours of learning. Keep in mind battery life when planning Sphero robot use in your learning setting.
- It is best to fully drain Sphero robots by using until the battery is low, and then fully charging for about 3 hours or until the blue charging indicator light stops blinking. If you repeatedly charge and play with partial charges it will decrease the battery life.

Get to Know Your Robot

- Keeping Sphero robots on the charger for long periods of time will not decrease battery life.
- If you are going to store your robots for longer than a week, we recommend putting the robot to deep sleep by following the simple steps below:
    - Connect to the Sphero Edu app, tap on your robot name to see the options, then select "Turn Off."
    - Or, place on its plugged in charging base
    - Press and hold the button on the side of the charging base while simultaneously lifting the robot off of the base
    - While the robot is off the base, unplug the charger from the power source
    - Your robot is now in deep sleep!
    - To wake, simply place the robot on the charging base and plug it in
- Before connecting to the Sphero Edu app, ensure your robot is fully charged and not in deep sleep
- Do not store Sphero robots below 50 degrees F or above 80 degrees F (Doing so can lessen battery life).



Care and Maintenance

Here are some tips for storing your Sphero robots:

- Sphero robots are waterproof; to clean simply wipe your robot with warm soapy water and dry it with a towel.
- Sphero robots are also shockproof. Pop it, lock it, drop it. Your ball can handle it. That being said, we don't recommend testing this theory from the top of a tall building.

The Sphero Edu App

Sphero Edu is the Sphero app for programming Sphero robots. It is your hub to create, contribute, and go beyond code with Sphero. Sphero Edu makes it easy for educators, learners and parents to be involved. Learners may build programs and complete activities, educators manage classes and take learning beyond code, and parents may even create accounts for their kids.

What you can do with the Sphero Edu app:

- Drive your robot and change colours.
- Create programs for your robot using three canvas types: Draw, Block, and Text.
- Connect your robots to run programs you have created or search for a host of programs created by the Sphero team and community.
- Set up a classroom with student logins, assign activities and track them in real-time.
- Create an activity and assign it to your class, or share it publicly with the community.
- Find learning activities for different skill levels and content areas aligned to Scottish CfE outcomes
- Collaborate with other users around the globe.
- Save your work by creating an account and jump between the apps or website.
- Find models of the Sphero robot to learn about the inner workings.
- Read the JavaScript Wiki to expand your coding knowledge!

Where to Get the App

The Sphero Edu app is available for free in the Google Play store and the iTunes store. The Chrome App, macOS app, and Windows 10 are all available for download. After you've downloaded and installed the app, create an account so you can save your Programs and Activities in the cloud.

Connecting with Bluetooth

When you are ready to connect your robot, open the Sphero Edu app on a compatible mobile device and sign in to your account.

Connect your SPRK+, Mini, or BOLT to Sphero Edu by opening the Sphero Edu app, holding your robot next to your device, and selecting "Connect Robot." Find your robot model, and then select your specific robot in the list. Usually the robot you are holding is the first on the list.

If you have a Sphero 2.0 or Sphero SPRK, you need to double-tap it, then pair it in Bluetooth settings before opening the app.

The Sphero Edu App

How to Get Started

To get started, charge your Sphero robot. Once your robot is sufficiently charged, open the Sphero Edu app, and connect your robot using Bluetooth. Then, use the Drive functionality to make your Sphero robot roll forward.

App Features

The Sphero Edu app includes many features, including:

- **HOME**
  - Feed - Overview of user activity in the Sphero community
  - 3D Models - Learn the inner workings of your robot
- **ACTIVITIES**
  - All Activities - Learning activities and lessons designed for Sphero, consisting of varying skill levels and content areas, that are all aligned to Curriculum for Excellence Benchmarks.
  - My Activities - Learning activities created by you.
  - Workbook - Activities you have previously opened.
  - +Create - Create your own learning activities.
- **PROGRAMS**
  - All Programs - Pre-created programs for Sphero. Connect your robot and run!
  - My Programs - Programs you have created. Programs may be created in three different ways designed for learner progression:
    - **Draw:** Beginners can give robots commands by drawing a path that represents code for their robot to follow.
    - **Block:** Intermediate programmers can use code blocks to learn more advanced logic.
    - **Text:** Advanced programmers can use text programming and write their own JavaScript.
  - JavaScript Wiki - Expand your knowledge of JavaScript coding.
  - +Create - Create your own programs for Sphero robots.
- **CLASSES**
  - Learners - Add and manage your class list and class rosters.
  - Assignments - Assign activities to your classes. Review assignment progress.
  - Moderate - Find the status of activities and programs you have submitted to the Sphero Edu community.
- **DRIVE**
  - Connect, drive and change the colors of your robot.

Sphero Edu Activities

Introductory Activities

Are you wondering where to start with Sphero in your educational setting? The best way is to jump right in and learn by experimentation and play! The Sphero Edu team has developed a series of activities designed to introduce you and your learners to Sphero.

First, we recommend choosing a canvas to learn. The app interface in which you will control the Sphero robot is called a canvas– and to support a wide range of skills and abilities, we've developed three canvases: Draw, Block, and Text. All three canvases are available in the Sphero Edu app.

Not sure which one to start with? Here is more information about each canvas:

- **Draw** - Uses a drawing interface. Effective from Reception to year 5and all class types.
- **Block** - Uses a drag-and-drop block interface and teaches the logical structure of code. Effective in Primary years 3-6, Secondary years 7-12 and all class types.
- **Text** - Uses the programming language JavaScript. Effective in Secondary years 7-12 and classes that focus on computer science and programming.

The Sphero Edu team has developed a series of activities designed to introduce you and your learners to Sphero.

Getting Started with Draw

Draw 1: Shapes: This lesson introduces learners to Sphero by challenging them to draw shapes that represent code and execute that code through the Draw canvas.

Getting Started with Blocks

Blocks 1: Intro and Loops: This lesson introduces learners to Sphero through an overview of the app, how to create programs using block coding, and how to use loops and operators.

Getting Started with Text

Text 1: Hello World: This lesson introduces learners to Sphero through an overview of the text canvas, how to use loops and operators, and tips for getting started with their first lines of JavaScript code.

Sphero Edu Activities

Classroom Management

To create a class in the Sphero Edu app, click on **Classes > Learners** and follow the directions to create a class and add your learners.

- To speed up the process, choose the "Add from Roster" option and upload a CSV file with the names of your learners.
- If you are a Google or a Clever user, you can automatically sync your classes. View more information here: https://edu.sphero.com/about.

If you need assistance visit the Sphero support website: https://support.sphero.com/support/home.

Sphero Edu Activities

If you would like to create your own activities in the Sphero Edu app, click on **Activities > Create** . Once created, you can find your activities under **Activities > My Activities**. To assign an activity to your class, navigate to the activity and click **Assign.**

Sphero Edu has a collection of learning activities found at https://edu.sphero.com/cwists/category. All Sphero Edu Activities follow this framework:

- **Exploration:** Activate learner prior knowledge related to the challenge. Consider starting Sphero activities "unplugged," meaning learners begin the activity by planning and brainstorming without the Sphero robots.
- **Skill-building:** Follow with learners completing a guided activity with Sphero to learn the skills needed for the challenge. Make sure to build in time for students to play, learn, and discover.
- **Challenge:** Learners use their new knowledge and skills to solve a problem utilising Sphero robots.

Whether creating your own activities or using the Sphero Edu learning activities, consider having additional supplies available for your Sphero learning activities. Example supplies could include cardboard, tape, scissors, paint, and other crafting supplies.

In addition, rubrics are a valuable tool for assessing learning when using Sphero robots. A Creativity and Innovation Rubric supplements Sphero well. Below are links to Creativity and Innovations Rubrics for different grade levels from the Buck Institute for Education:

- K-2 Creativity and Innovation Rubric
- 3-5 Creativity and Innovation Rubric
- 6-12 Creativity and Innovation Rubric

Sphero Edu Activities

Reception to year 5

The activities below require knowledge of the Draw or Blocks canvas. Many of these lessons have a slight focus on different curriculum areas as indicated. You can find more lessons designed for reception to year 5 on the Sphero Edu app or website.

- Draw 1 - 3 (Intro Activities) Draw 1: Shapes Draw 2: Spelling Draw 3: Perimeter
- Blocks 1 - 4 (Intro Activities) Blocks 1: Intro & Loops Blocks 2: If/Then, Else Blocks 3: Lights Blocks 4: Variables
- What a Character (Language and Storytelling)
- The Heart (Science)
- Area of Rectangles (Maths)
- Maze Mayhem (General)
- Perimeter (Maths)
- Light Painting (Art)

Year 6-8

Most of the activities below require knowledge of the Blocks canvas. Many of these lessons have a slight focus on different curriculum areas as indicated. You can find more lessons designed for Years 6-8 on the Sphero Edu app or website.

- Blocks 1 - 4 (Intro Activities) Blocks 1: Intro & Loops Blocks 2: If/Then, Else Blocks 3: Lights Blocks 4: Variables
- What a Character (Language and Storytelling)
- The Heart (Science)
- Secret Message (Social Studies)
- Planetary Motion (Science)
- Helmets for the Win! (Science)
- Avoid the Minotaur (General)

Years 9-12

Most of the activities below require knowledge of the Blocks or Text canvases. Many of these lessons have a slight focus on different curriculum areas as indicated. You can find more lessons designed for Years 9-12 on the Sphero Edu app or website.

- Blocks 1 - 4 (Intro Activities) Blocks 1: Intro & Loops Blocks 2: If/Then, Else Blocks 3: Lights Blocks 4: Variables
- Text 1 - 4 (Intro Activities) Text 1: Hello World Text 2: Conditionals Text 3: Lights Text 4: Variables
- The Heart - Secondary School (Science)
- Atom Tracks - Secondary School (Science)
- Fortune Teller - Secondary School (Maths)
- Morse Code - Data Structures (Computer Science)

Sphero Edu Activities

Engineering and Robotics Activities

Are you teaching engineering or robotics? The activities below encourage teamwork, collaboration, and creativity. Many of them employ open challenges that require students to practice engineering design principles and make use of room, time, or material constraints.

Activities to explore in the Sphero Edu app:

- Avoid the Minotaur
- Bridge Challenge
- Chariot Challenge
- Maze Mayhem
- Sphero City
- Tractor Pull
- Swim Meet
- Jousting Tournament
- Build a Sphero Run

Coding Sequence

Are you teaching your learners to code? Follow the sequence below to introduce your learners to computer science fundamentals, JavaScript syntax, and industry standards like pseudocoding, debugging, and refactoring.

Note: These activities are considered advanced and are primarily geared for students in Secondary. While you do not have to complete these in the order below, many of them build upon the skills gained in previous activities.

Activities to explore:

1. Text 1: Hello World
2. Text 2 - Conditionals
3. Text 3 - Lights
4. Text 4 - Loops & Variables
5. Morse Code - Data Structures
6. Fun, Fun, Functions
7. Recursion & Ocean Colors

Units of Learning - Space

Key Stage 2: Space - Computational Thinking with Sphero

Minimum of three charged Sphero robots, compatible devices, and the Sphero Edu app needed.

By the end of the unit pupils will be able to:

1) design, write and debug programs that accomplish specific goals; solve problems by decomposing them into smaller parts;
2) use logical reasoning to explain how simple algorithms work and to detect and correct errors in algorithms and programs;
3) use sequence, selection, and repetition in programs;
4) use technology safely, respectfully and responsibly

	Lesson 1 Rocket Launch	Lesson 2 Space Orbits	Lesson 3 Star Wars Show	Lesson 4 Discover Mars
Sphero Robot	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT
NC Computing Objectives	To solve problems by decomposing them into smaller parts	To design & write programmes that accomplish specific goals	To design, write and debug programmes	To use logical reasoning to explain how some simple algorithms work
Outcomes	• I can solve a problem by decomposition. • I can plan an enquiry.	• I can design a programme to make a circle. • I can describe the movement of the Earth, Moon & Sun.	• I can write and debug a programme. • I can listen with attention to detail and recall sounds.	• I can use logic and key vocab to explain a programme. • I can describe positions on the full coordinate grid.
Subject Focus	Science	Science	Music	Maths
Curriculum Links	UKS2 Working Scientifically	UKS2 Working Scientifically	UKS2 Music	UKS2 Geometry
Activity Outline and Steps	**Rocket launch** Students explore movement and controls. What can a Sphero robot do and not do? Watch rocket launch video. Decompose task: launch a Sphero robot like a rocket in small groups (speaks countdown, rolls quickly & stops). Use movement, controls and sound to programme. Film demos.	**Our solar system** Recap Sun, Moon & Earth orbits using students as planets. Demo of Shape Shifter program and explore editing variables. Discuss how to make circle (spin & speed block). Students programme at least three Sphero robots to model their two orbits. Design programmes in pairs and then test in small groups. Review each other's programmes.	**Star Wars Show** Students design a light show to music. Watch an example from the Sphero Edu app that uses Uptown Funk. Use the Star Wars opening credits music, in 15 second chuncks. Design light show in rhythm to music. Share your programme with other groups.	**Discover Mars** Students explore Mars' surface using Google Earth. On large grid, design a route for the rover from the Habitation Zone to find water. Students programme a chosen route to discover water. Narrate journey and add comments to blocks.
Challenge	Can you add a "blast off" sound to your programme?	Can you make the Sun, Moon & Earth different colours that fade?	Can you explain why it's easier to use the strobe block over multiple LED blocks?	Can you reflect the location of one rover on the grid in another quadrant?
Resources	Magic 8 demo Blocks launch template	Shape Shifter demo Blocks circle template	Uptown Funk demo Music & sound	Google Mars demo Large 'Mars' grids with Habitation Zone & hidden water/ice
Assessment	Invite other classes to come and enjoy the tour – does it work?	Opportunity to assess understanding of process as well as code creation.	Observations - Are visitors able to play the game using their instructions?	Observations & Programmes

Units of Learning - Space

Keyt Stage 2: Space - Computational Thinking with Sphero

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1) design, write and debug programs that accomplish specific goals; solve problems by decomposing them into smaller parts;
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3) use sequence, selection, and repetition in programs;
4) use technology safely, respectfully and responsibly

	Lesson 5 Space Quiz	Lesson 6 Alien Contact, Ep. 1	Lesson 7 Alien Contact, Ep. 2	Lesson 8 Meteor Crash
Sphero Robot	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT
NC Computing Objectives	To use sequence, selection, and repetition in programs	To design, write and debug programmes	To design, write and debug programmes	To detect and correct errors in algorithms and programs
Outcomes	• I can use the if/then blocks to include conditionals. • I can explain day and night referring to Earth's rotation.	• I can use functions to create a programme. • I can explore the patterns and sounds of language.	• I can test out and edit a programme for a specific goal. • I can explore the patterns and sounds of language.	• I can detect and correct errors to debug a programme • I can apply attacking and defending principles.
Subject Focus	Science	MFL & Literacy	MFL & Literacy	Physical Education
Curriculum Links	Yr 5 Earth & Space	KS2 Foreign Languages	KS2 Foreign Languages	KS2Team Games
Activity Outline and Steps	**Earth Quiz** Research Earth facts safely & recap Earth's rotation related to day/night. Play Simon Says to explore If/then commands. Explore If/Then and If/Else blocks for Simon Says. Students choose 5 Earth questions and design a programme for a quiz. What happens when some answers right/wrong?	**Alien language 1** Watch 'Arrival' clip and discuss symbol language. Students will choose 5 common words and design a symbol to represent each word. Use functions to create a programme for the new language. Students will paint their language symbols by covering a Sphero robot in paint and running their programme.	**Alien language 2** Students will explore other languages that use symbols for whole words. Look how certain words are written in Kanji. Try to decode the words man, tree, river. Students will run their programmes made in part 1 for another group to decode. As an added bonus, use a long-exposure app to capture each sybmol's light path.	**Meteor crash** Watch meteor shower video, and discuss how students would defend the Earth from such an event. Explore If/Else conditionals and the event called "on collision." Review the Earth's orbit from lesson 2 and design a programme for Meteors. Take time to debug their programme before trying to defend or attack the Earth with their programmes.
Challenge	Can you programme a Sphero robot to change colour if you throw it?	Can you make a sentence using your new language?	Can you use glow in the dark paint to create a different effect?	Can you programme a Sphero robot to swim backstroke? Take it swimming!
Resources	Blocks template Earth facts Rotation demo	Function templates Pens, paints & large paper Symbol examples	Kanji examples Part 1 programmes Long exposure app	Blocks template to debug
Assessment	If/then exploration Programmes Review of others'	Symbols designed Functions Painted symbols	Guessing each other's programmes Long exposure images	Programmes Detecting errors Attack/defence

Units of Learning - World

Upper Key Stage 3: World - Computational Thinking with Sphero

Minimum of three charged Sphero robots, compatible devices, and the Sphero Edu app needed.

By the end of the unit pupils will be able to:

1) design, use & evaluate computational abstractions that model the state & behaviour of real-world problems & physical systems;
2) understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem;
3) understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming.

	Lesson 1 Ocean Food Webs	Lesson 2 Ugandan Water	Lesson 3 American Art	Lesson 4 Chinese Opium
Sphero Robot	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT
NC Computing Objectives	To understand key algorithms that reflect computational thinking	To model the state & behaviour of real-world problems	To use logical reasoning to compare algorithms	To evaluate computational abstractions
Outcomes	• I can describe the interdependence of organisms in a food web.	• I can research a different culture to understand user needs.	• I can describe and imitate the work of Lee Krasner.	• I can describe the causes of the Opium Wars and the journey from Britain.
Subject Focus	Science	Social Studies	Art	Social Studies & Health
Curriculum Links	Biology & Ecosystems	Design and Engineering	Expressive Art	World History & Drug Abuse
Activity Outline and Steps	**Ocean food webs** Discover Sphero and what it can and can't do. Students explore food webs to better understand producers and consumers. Introduce the concept of sequencing & its importance when creating algorithms. Draw large ocean web & use a Sphero robot to show energy transfer.	**Ugandan water** Watch the video of people walking for water in Uganda. As a class, discuss sanitation issues around the world and brainstorm solutions. Explore pullies and how to build a well. Create pulley that can lift a Sphero robot from the ground to table height.	**American art** Look through the work of Lee Krasner. Have students share their thoughts and reactions to her art. Explore different programatic algorithms and predict which will produce certain shapes. Test each of the different algorithms and compare ther results with your. Students will add mutliple algorithms to a loop to recreate some of Krasner's paintings.	**Chinese opium** Watch the mini-documentary on the 1830s Opium wars, or discuss key points with students. How does this historical issue compare to current issues surrounding recreational drug use and the inherent dangers. Students will role play as traders from the UK travelling, trading, and warring with the Chinese. Using a "smuggling map," show the traders' journey. Study the If/Else programmes that show the traders' journey carrying tea/opium. Debug your chosen algorithm and narrate Sphero's journey.
Challenge	Can you model bee pollination using similar algorithms?	Can you work out how much water is equivalent to a Sphero robot's weight?	Can you make a Sphero robot imitate the art of Yayoi Kusama?	Can you programme one Chinese and one British Sphero robot to combat?
Resources	Videos A2 paper & pens	Video Building materials (e.g. kebab sticks, bottle stops, string)	Algorithm examples (Paints & paper, use Location data images)	Template algorithms Large map of the world traced on A1
Assessment	Discussion of food webs Algorithms	Research Group discussions Pulley models	Predictions Loops Evaluation	Role play Discussion of programmes Algorithm and narration

Units of Learning - World

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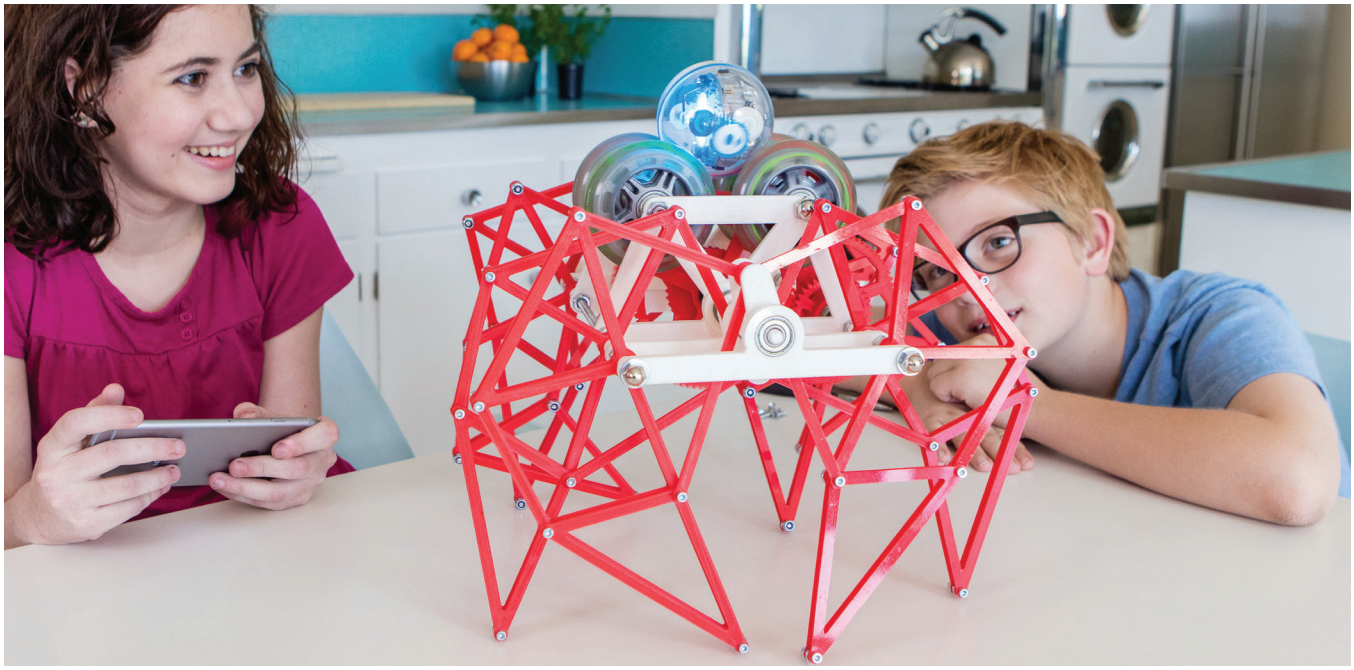
1) design, use & evaluate computational abstractions that model the state & behaviour of real-world problems & physical systems;
2) understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem;
3) understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming.

	Lesson 5 British Painters	Lesson 6 Costa Rican Turtles	Lesson 7 Endangered Animals	Lesson 8 Global Code
Sphero Robot	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT	SPRK+, enhanced with BOLT
NC Computing Objectives	To design & use computational	To design & use computational abstractions	To understand simple Boolean logic	To understand simple Boolean logic
Outcomes	• I can use loops in my models. • I can describe the results of translation, rotation and reflection.	• I can design programmes that model problems. • I can explain how human processes influence environments.	• I can explain why and how Boolean logic is used. • I can explain why some species become extinct.	• I can use Boolean logic. • I can use globes and atlases to find out information.
Subject Focus	Maths	Geography	Science	Geography
Curriculum Links	Shapes	Human / Physcial Geography	Biology	Fieldwork
Activity Outline and Steps	**British painters** Explore the work of Bridget Riley. Identify examples of mathematical translation, rotation and reflection. Students will discuss use of loops in other programs and how they could be used to recreate Riley's art work. Devise a way to attach a marker to a Sphero robot. Create programmes that create patterns similar to her art. Run the programmes with the marker attached. What was the result?	**Costa Rican turtles** Review If/Else statements. As a class, watch the video of turtle egg poaching in Costa Rica. Discuss the consequences to human interference and other human influence on the environment. Discuss what an accelerometer is and how it can be used in their programmes. Programme a Sphero robot to fool the poachers by rolling to the sea (use If/Else statements to overcome holes and hills in sand.)	**Indian mammals** Watch the endangered animals video and identify the animals native to India. Introduce boolean logic through the 20 questions programme. Have students predict what happens when use they AND/OR/NOT in a search engine. Use a desired search engine to search for different Indian animals using boolean logic. Compare each other's search results and discuss their observations	**Global code** What are the differences between a globe and an atlas? Spend some time making observations of the African continent. Review boolean logic together as a class. Pick an African country and describe it using Boolean logic (e.g. It is north of Sudan AND east of Libya.) Students will use the programme template that speaks AND/OR/NOT at random to complete sentences. Use this to describe the country you chose and try to guess your classmates'.
Challenge	Can you work out how to see your code written in JavaScript?	Can you make a Sphero robot jump around to scare the poachers?	Can you programme a Sphero robot to jump like a frog?	Can you make a Sphero robot travel across a globe visiting different countries?
Resources	Markers, plastic cups, and tape	Videos Sand pit (ideally!) with holes and hills	Videos Internet enabled devices for web browser searches	Template programme Globes & atlases
Assessment	Discussion of geometric transformations Programmes	Programmes Discussion of human factors	Discussion on extinction Search results	Descriptions Guessing others'

Supplemental Resources



Sphero Created Activities

All Sphero Edu activities can be found at https://edu.sphero.com/cwists/category. Find an activity that meets your learning objectives and continue learning with Sphero!

Thursday Learn Day

On Thursdays, the Sphero Edu team posts new programs that you can try with your learners! You can find these programs here: https://edu.sphero.com/remixes.

Troubleshooting Website

You can find support for most Sphero issues on our support website: https://support.sphero.com/support/home.

If you are having connection troubles, try the following strategies:

- If the robot does not connect to Sphero Edu, place your robot on the charger for 15 seconds to ensure it's not in deep sleep, then try again.
- If your robot is disconnecting often and you are in a room with a lot of users, try turning off wifi and bluetooth on the devices that are not being used with a robot. Limiting a room to about 20 robots and programming devices or less is a good rule of thumb.

Supplemental Resources

Javascript Wiki

The Sphero Edu documentation is located here: https://sphero docsapp io/docs/get-started This wiki is a guide for students and teachers to learn how to program Sphero robots with JavaScript, the most common web programming language in the world

Research / Case Studies

Programming with Sphero Edu's app-enabled robots fosters skills that lead to a wide variety of careers However, when it comes to mainstream coding instruction, demand still outweighs supply We're here to close the gap and help bring the future into classrooms today

STEM and STEAM curriculum are a critical part of Primary and Secondary education, and superlative approaches to sharpening 21st-century skills will hinge on better coding instruction The best solutions include coding that is interactive and fun, but also strategies that go beyond code by incorporating robotics and technology with collaborative STEAM activities, nurturing students' imaginations in new and exciting ways These types of solutions appear to be moving the needle for local education authorities looking to improve coding instruction According to the CDE survey, respondents who use Sphero solutions were more likely to say that coding instruction was meeting students' needs

Instead of looking at coding as a requirement to fulfill, Primary and Secondary schools should consider it an open-ended form of art. Better coding instruction sparks divergent thinking and creativity; these concepts, coupled with the real-world benefits of learning how to program, will change the playing field for every student in Scotland over the next five years and beyond Read more about coding and STEM/STEAM skills in our schools by reading Cracking the Code: Six keys to better coding instruction in K-12 education, a case study with Sphero in the K-12 classrooms in the US

Marketing Resources

The brand assets for Sphero Edu are located at brandfolder com/spheroedu This Brandfolder is for educators and community members seeking logos, images and general up to date information about Sphero Edu

Administrator Guide

Share the Administrator Guide with principals, curriculum directors, instructional technologist and any other administrators at your school that want to learn more about Sphero Edu

Supplemental Resources

Makerspace Guide

Review the Makerspace Guide for specific ideas for integrating Sphero robots into maker learning.

Social Media

Connect with Sphero Edu online for ideas, tips, and resources:

- Facebook: https://www.facebook.com/GoSphero/
- Twitter: https://twitter.com/spheroedu
- Instagram: https://www.instagram.com/sphero/
- Pinterest: https://www.pinterest.com/sphero/

Sphero Blog

Visit our education blog for updates, tips, and suggestions: https://medium.com/@SPRK.

Support

- Support Home
- Contact Us

Security & Privacy

We are dedicated to ensuring Sphero Edu is safe and secure to use. Some of our efforts include third party testing, annual audits, and a bug bounty program.

We are GDPR & COPPA compliant, have signed the Student Privacy Pledge, and publish all of our privacy practice agreements online. Visit https://www.sphero.com/privacy for more information.