

littleBits[®] by sphero[®]

EDUCATOR RESOURCE

GUIDE



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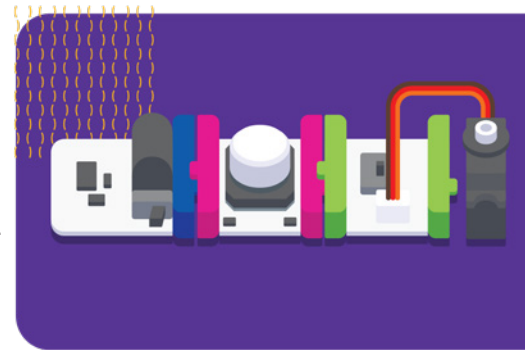
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Introduction to littleBits

Welcome to the littleBits Educator Resource Guide! Sphero makes undeniably cool educational tools that transform the way kids learn and create through coding, science, music, and the arts. The Sphero ecosystem of tools and content gives kids, teachers, and parents of all learning and coding abilities a blank canvas to solve challenges at home, in school, and beyond. So how can littleBits be used in your pedagogy?

The Educator Resource Guide is designed to help you achieve the following objectives:

- Learn about littleBits and how they can be used across a variety of formal and informal learning environments.
- Understand how littleBits can supplement and enhance their existing curriculum, or often as part of a larger project-based unit.
- Dive into littleBits Classroom and the Fuse app.
- Review littleBits lessons and inventions to understand how to find the right ones for you and your class.
- Discover ways to make it all work in any classroom environment.



Mission in Education

littleBits empowers everyone to create inventions, large and small. littleBits makes it easy for both teachers and students to engage in STEAM by using a universal, 21st-century language: electronic building blocks. We are surrounded by technology every day and yet have little idea how it works or how to create with it. littleBits changes that.

How is littleBits Being Used In Education?

littleBits is a full range tool for students across all grade and ability levels. While the products are recommended for ages 8 and up, successful programs have been run with younger students under adult supervision.

Students can work with littleBits at their own level and pace thanks to the opened-ended design. From elementary school to college and from special education to gifted and talented programs, littleBits is a useful hands-on learning tool for all students. littleBits also encourages communication and collaboration, making it a useful tool for English language learners. Even students in university courses, pre-service teachers, and teachers involved in professional development use littleBits for hands-on learning about STEAM.

littleBits is a solution that brings all students together. Students are all included, regardless of gender, interests, culture, language, socio-economic class, or skill level. littleBits is not a prescriptive or linear tool. All students can innovate, invent, and achieve their creative vision with littleBits.



Primary, Secondary, & Higher Education

A global community of educators is using littleBits to ignite their students' curiosity and engage them in active inquiry and problem solving. The flexibility and adaptability of the Bits mean students of all ages and abilities can use them to create very simple or very complex inventions. Both novice and experienced educators use littleBits as a cross-curricular, multisensory tool to reach students through multiple learning modalities.

Beyond the Classroom

Educators are finding creative ways to use littleBits with students in less formal settings. Before-school and after-school programs and clubs can be an effective way to attract students to science, math, and engineering concepts, and can target underrepresented populations such as girls. Other implementation models include summer school and remedial intervention programs.

In addition, makerspaces are being implemented in school library programs to encourage innovation and creative design. Educator-led design workshops give students an opportunity to experiment with littleBits in open-ended design challenges.



The Home-School Connection

littleBits is a tool that can transition between learning spaces and environments. While technology literacy may begin within the school, littleBits can build strong home-school connections as students transfer their skills into an interest in electronics and design thinking at home. littleBits can foster both parent and child growth through shared invention and collaboration.

Competitions

Sphero Global Challenge is the ultimate STEM competition and an opportunity for students to go deeper with computational thinking, engineering, and programming skills. Teams of all abilities are encouraged to identify problems, develop solutions, and work together to accomplish their goals in invigorating sportsmanlike games and challenges.



Why Are littleBits a Valuable Educational Tool?

littleBits products are at the intersection of important trends in education today: STEAM programs, the Maker Movement, project-based learning, personalized learning, 21st-century skills and design thinking. The electronic building blocks that make up the littleBits system represent a powerful and universal language to help students become not only intelligent consumers of technology, but also inventors of the world around them.

STEAM Education

STEAM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, art, and mathematics. littleBits encompasses this approach through authentic and creative design exploration and challenges that foster hands-on learning about the scientific and mathematical world.

Experimentation and playful thinking with littleBits often produce unique and creative outcomes, which can reach across many areas of the curriculum. In addition to learning about science, students develop key mathematics skills and learn to communicate their designs through writing and drawing. Younger students may even learn foundational skills, such as logic and directionality.

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



[Teaching Physics with littleBits Robots](#)



[How to Use littleBits the Robot for Incredible STEM Lessons](#)

Maker Movement

The Maker Movement describes a move in education toward experiential environments in which students construct their learning through hands-on exploration and “do-it-yourself” or “do-it-with-others” projects. Making happens any time students use technology to make something.

littleBits supports the modern Maker Movement by adding new technologies to the mix, including hardware (the Bits), computing platforms, and programming tools (for example, Arduino) alongside traditional materials and tools.



Educators can use littleBits as a Maker’s tool for modern invention and innovation. littleBits sparks curiosity and heightens student awareness of electronics and their proliferation in our everyday lives. Because the Bits require no prior expertise, students of all ages can use littleBits to experience the joy of building with electronics instantly.

Project Based Learning (PBL)

littleBits can play an integral role in any project-based learning unit. The open-ended design possibilities give students an opportunity to innovate solutions to real-world problems for authentic learning that they can use to understand the world around them.

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](#)



Personalized Learning

littleBits allows educators to design lessons and projects that are more open and flexible than traditional models. Students can become more invested in designing their own personal learning path where they can learn at their own pace and capitalize on their unique skills. littleBits can fuel personalized learning by giving students more control, a sense of ownership, and accountability in the learning process.

Review these resources to learn more about personalized learning:

[Personalized vs Differentiated vs Individualized Learning](#)

[3 Ways to Personalize the Learning Experience](#)

21st-Century Skills

With a focus on real-world problem solving with technology and critical thinking, littleBits help students develop key 21st-century skills for learning and career readiness. They provide a natural environment for students to practice collaboration, critical thinking, communication, and creative design. These skills, outlined by the Partnership for 21st Century Learning, are vital for today's students to survive in tomorrow's job market. Twentieth century skills – rote memorization, repetitive tasks and general knowledge – just won't cut it.

Design Thinking

Students use littleBits to prototype solutions to authentic problems and implement design solutions. The Bits are easy to use, allowing students to come up with more sophisticated solutions as part of the design thinking process developed by Stanford University, in which students empathize, define, ideate, prototype, and test design solutions. littleBits creates a low-risk environment for students to experiment with ideas that may not have been possible before.

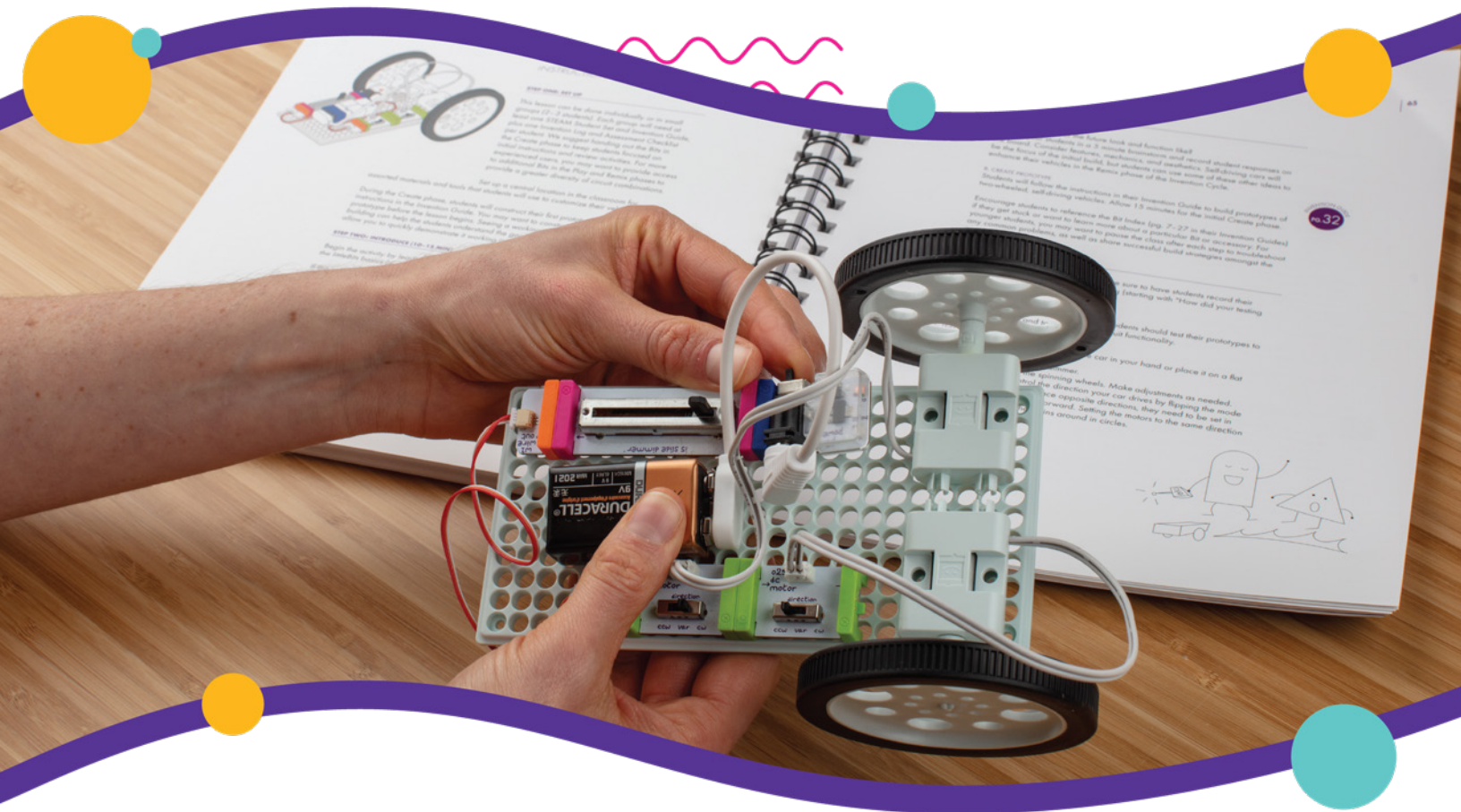
Once students design and test prototypes, they may revisit the iterative design process to improve upon their designs and develop working prototypes that could potentially be taken to market or “marketed” in the classroom. As students take action on their products, they develop entrepreneurship skills in business strategy, marketing, branding, and finance.



Alignment to Standards

The implementation models for littleBits are flexible and adaptable. Lessons or units that incorporate littleBits align well to contemporary standards, such as the Next Generation Science Standards (NGSS) and Common Core State Standards (CCSS).

In addition to being a useful learning tool, littleBits can also serve as a key assessment tool that, when used in conjunction with education standards, can provide educators with an authentic assessment of how students understand and perform on key indicators. littleBits provides opportunities for both formative and summative assessments that may incorporate cross-curricular standards, such as English Language Arts and Math.



Becoming Familiar with littleBits

How littleBits Work

The Bits are designed to snap together, end to end, to create a complete circuit. The magnets inside each of the Bits' connectors ensure that students always attach the Bits the right way.



The Power Bit, Battery & Cable

Each student or student group will need a power Bit, a 9V battery, and a littleBits battery cable. All three components are necessary to start a circuit.

The Color Code

Bits are grouped into four color-coded categories:



POWER
is needed in every circuit and is the start of all your students' creations.



INPUT
Bits add control to the circuit, through information provided from your students and/or the environment, and send signals to the Bits that follow.



OUTPUT
Bits complete an action or task (for example: light, buzz, or move). These are the Bits that "Do Something".



WIRE
Bits expand the circuit's reach and change direction. Students use the wire Bits to help place Bits exactly where they want, especially if they are embedding inside a structure. Some orange Bits also add a level of complexity and programmability to the circuit.

Order is Important

Power Bits always come first and input Bits only affect the Bits that come after them.



Making Adjustments

Some Bits are designed to be adjustable, allowing students to have greater control over the input and output options. The switches and screws are meant to be interactive.

Some Bits have switches to change modes (for example, the DC motor spinning forward or in reverse, and the number Bits displaying “value” or “volts” mode). Other Bits have small screws to make adjustments, for example, changing the timing of the pulse or specifying a color for the RGB LED.

You can learn more about making Bit-specific adjustments by viewing the Bit’s respective information card (see Student Support Resources, p. 24). Each card includes a description of the Bit’s function, instructions for adjusting the Bit, and an illustration of how the Bit might be used within a circuit.

Student Grouping Options

Students can work with littleBits in pairs or small groups (3-4 students). Keep in mind that larger groups can be problematic and students may become frustrated if there aren’t enough Bits to go around, particularly power Bits, batteries, and cables as these are limiting factors within a circuit. While some students may prefer to work alone, grouping students encourages collaboration and may lead to increased learning gains through peer communication.



Groups can be determined by interest or project, for example, grouping students who are interested in designing a home improvement device. In this option, it is recommended that you divide the kits to best match the Bits to the project. Other options include mixed grouping by ability level, gender, or special needs.

Storage and Organization

While littleBits provides storage options for your kits and collections, you may find that keeping Bits in their original packaging does not fit your classroom needs.

Some educators use a tackle box or similar organizer to divide and store littleBits by Bit color. Color-coded bins or tubs are also useful for organizing Bits by function. By labeling bins with littleBits colors, students can easily find what they’re looking for and put everything away with little trouble.

Depending on your classroom use, you may find it useful to organize Bits by project, for example, collecting a variety of LED outputs for a flashlight design challenge. Labeled plastic bags, food storage containers, plastic cups, and shoeboxes are useful for organizing Bits by sets or challenge kits. Additional storage solutions can be found at littlebits.cc/tips-tricks/tips-tricks-storage-solutions-for-the-pro-library.



Care and Maintenance

Handle with care. Bits are electronic components, and while they are designed to be robust, they are not invincible. To minimize breakage, teach students how to take care of them. Bits should never be thrown or dropped, and students should handle the pieces with moveable components with extra care. The wires should not be twisted, crimped, or bent at extreme angles.

You may want to distribute littleBits to students on lunch trays or large paper plates, providing students with a work surface that may lessen the likelihood of Bits accidentally being dropped to the floor. This can also expedite the cleanup process.

littleBits Classroom

littleBits Classroom contains many useful resources to get you started with littleBits in the classroom. Easily access lesson plans, educator guides, activities, troubleshooting tips, and customizable handouts for different grades, subjects, and learning pathways.

<https://classroom.littlebits.com/welcome>

Classroom Features

littleBits Classroom contains many features, including:

- Getting started resources
- Unit plans, lessons, and inventions curated for your specific kit and classroom needs
- Educator and student resources, including the Bitopedia and Invention Guide



littleBits Lessons

littleBits has created 100+ standards-aligned STEAM lessons and inventions that can be teacher-led or self-guided. The activities are designed for all ages and skill levels so students can grow with them. As an educator, you can explore and find the right lesson for your classroom.

Introductory Lessons

Are you wondering where to start with littleBits in your educational setting? The best way is to jump right in and learn by experimentation and play! The littleBits team has developed a few mini-lessons designed to introduce you and your students to littleBits. Each lesson takes about one hour.



Exploring How littleBits Work



Reverse Engineering with littleBits

Once you've completed the Mini-Lessons, try out a curated selection of inventions and lessons to get started with littleBits Classroom.

Check out <https://classroom.littlebits.com/curriculum/at-home-learning-starter-kit> to get started.

Once you feel comfortable with the Bits, check out the inventions and lessons on [littleBits Classroom](#) for endless inspiration and fun!



Create Your Own Lessons

Do you have a great littleBits lesson idea? Have you inspired your students with littleBits and want to share your story?

On the littleBits Classroom site you can upload your own lesson idea: <https://littlebits.cc/browse-lessons>



Fuse App

The **littleBits Fuse app** gives you the tools to create a picture of your littleBits circuit and write programs for your codeBit. You can also write notes about your work in the notebook. If you're using Fuse in a class, you can save all these things as a workspace, and you can load workspaces to go back to your previous circuits and programs.

Teacher and Student Accounts

You can login to the Fuse app with Teacher and Student Accounts created in littleBits classroom. <https://classroom.littlebits.com/persona>

Circuit Builder

Select "Circuit Builder" mode to create circuits with Power Bits, Input Bits, Output Bits, and Wires. Students can create their circuits using the app before testing it out with the physical Bits. This is a great option if you have a limited number of Bits that are being shared between groups.

Coding Canvas

Select "Code" mode to code the codeBit. Connect Fuse to your codeBit with a bluetooth connection to send your program to the CodeBit.

Notebook and Workspace

A workspace includes your current circuit design, program and notes. Save and load workspaces with your littleBits classroom account.

Compatibility

- Compatible with Chrome browser and Chrome OS (81 or higher); Windows 10 (1706 or higher); Mac OS (10.13 or higher)
- To send Fuse programs to the codeBit, the device must have bluetooth built-in.

[Download Here >](#)



Supplemental Resources

Sphero is empowering the future creators of tomorrow and setting them up for success. We couldn't be more excited about the future of education and the part we're playing. For more information about Sphero and to get involved in our community you can find links to additional resources below.

- **Sphero Blog:** Visit our education blog at <https://sphero.com/blogs/news> for updates, tips, and suggestions.
- **Support:** <https://support.sphero.com>
- **Community Forum:** <https://community.sphero.com>
- **Contact Us:** <https://sphero.com/pages/contact-us>
- **Brand Assets:** <https://brandfolder.com/spheroedu>
- **Facebook:** <https://www.facebook.com/GoSphero>
- **Twitter:** <https://twitter.com/spheroedu>
- **Instagram:** <https://www.instagram.com/sphero>
- **littleBits Educator Case Studies:** littlebits.cc/steam-resources
- **littleBits Educator Spotlight Stories:** littlebits.cc/tag/educator-spotlight