Bring micro:bit Kits to Your Classroom

Grant Reference Guide for Educators

The information in this guide aligns to common grant application questions. We hope it is helpful as you prepare a project proposal or justification for including micro:bit Kits in your budget.

Please contact us at info@booleangirl.org with any questions.

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Company & Product Description

a. Mission

The mission of Boolean Girl is to diversify STEM (science, technology, engineering and math) by teaching and inspiring girls, low-income students, and underrepresented youth in grades three through eight through meaningful, hands-on instruction and sustained exposure to computer science and engineering in a collaborative and welcoming environment.

b. History

We are parents and engineers, educators and nonprofit leaders. We founded Boolean Girl in 2014 to encourage and inspire girls who are often underserved when it comes to teaching STEM. At a young age, girls receive fewer opportunities to learn subjects like coding and engineering, so we focus on ages eight to 14. While there are tech programs for girls over 14, there are few that cultivate early and sustained interest in coding and engineering. That's where we come in. We have expanded our programs over the years to include a focus on students of color and under-resourced youth—groups historically underrepresented in STEM fields.

c. Product Details

○ The micro:bit itself is packed with inputs and sensors so you can immediately have success programming it and creating inventions that light up and make sound.

○ Program the micro:bit in Scratch, Microsoft MakeCode, Python, Javascript and other programming languages. Since many of these are web based, it does not require additional drivers and can be used with almost any web enabled device.

○ micro:bits are great for digital making as well as craft and e-textile projects. The motor, LEDs, and buttons are all designed to snap on to Legos.

○ One of the key features of the micro:bit is its versatility. It can be used to create a wide range of projects, from simple games and animations to more complex projects that involve sensors, motors, and other external components. It can also be connected to other devices via Bluetooth, such as smartphones and tablets, allowing children to create interactive projects that can be controlled remotely or that can send and receive data.

1. micro:bit Base Kit

• The micro:bit Base Kit includes a micro:bit and the accessories to get started on simple projects as well as accessories to extend the micro:bit and add motors, external lights, and buttons to build dozens of projects. Watch as critical thinking, collaboration, creativity, and confidence build.

2. micro:bit Sensor Kit

- The micro:bit Sensor Kit extends the micro:bit Base Kit by providing an array of devices that increase the types of interactions you can have with the micro:bit. Using the kit, you work with hardware and software together to enhance existing projects and design, build, and prototype new physical gadgets.

- The new Sensor Kit adds:
  - a fun LED light strip that you program and control with the micro:bit.
  - a OLED monitor that you can use to display text. It is small but a huge step up from scrolling data in the LED field of the micro:bit.
  - a sensor that can be used for collecting temperature and humidity for you scientific experiments.

*Note: The Sensor Kit does not include a micro:bit or an edge connector. These components are included in the Base Kit and are needed to use the sensors.

3. micro:bit Motion Kit

- This kit is an add on kit for the micro:bit Base Kit that allows children to explore mechanical engineering, coding, and circuits.

- Use legos to prototype engineering solutions that MOVE! Build your own robots, add headlights, use a range sensor to add collision avoidance and a second micro:bit (sold separately) to control it using the radio feature. Use gears to adjust speed and torque while gaining an understanding of gears and gear ratios. Code the control functions in MakeCode, Python or JavaScript.

- This kit contains the lego blocks needed to build dozens of different projects with the two lego compatible motors. The motors from included in this kit are continuous rotation motors that spin all the way around. (The motor in the Base kit is a traditional servo motor that rotates back and forth and is great for creating a steerable wheel for a robot.)

*Note: The Motion Kit does not include a micro:bit, an edge connector. These components are included in the Base Kit.

Identifying Need

Statistics strengthen your passionate message with evidence.

Use these resources to find meaningful data that supports your request for funding:
- Code.org's CS stats for promotional purposes
- Additionally, here is a Girls in STEM article from ROX (Ruling Our Experiences) that digs into the need for STEM education for girls, and the impact it can have on their confidence and careers.
- Million Girls Moonshot provides statistics on the impact of STEM education on youth.
- A Gallup report shows the gender gap in STEM careers and why that gap is not closing.

Identifying Impact

Spark an interest in technology, computer science, and engineering
micro:bits are easy and effective learning tools to teach digital skills and creativity, enabling children to engage in the digital world and integrate these learnings into other subjects such as math, science, and art.

Connect learning with real-world applications
Through hands-on experience with the micro:bit, students make connections between abstract ideas of coding and real world outcomes in hardware.

Build confidence
Learning to fail is an important element in developing confidence. With micro:bits, students work iteratively to improve their gadgets along the way, making mistakes, trying again, and learning as they create.

The Research

micro:bit Educational Foundation has research on the impact of the micro:bit in developing digital skills, creativity, and computational thinking.

Boolean Girl has case studies from educators who have integrated micro:bits into their curriculum:
- Montgomery County, MD
- Washington, DC

Measuring Success

Funding proposals often require proof that the potential grantee's work is efficient and effective, both in cost and outcomes. Begin by describing how your proposal aligns to your school's goals and include specific outcomes you will be able to measure.

Aligning to Your School
micro:bits can be integrated in a variety of core curricula through activities that connect to national standards including: Common Core Standards, Next Generation Science Standards, and International Society for Technology in Education (ISTE) Standards.

Seek out your district's published goals and consider how your proposal will align. Many districts commit to goals similar to one or more of the following examples:
- Implement Common Core State Standards Initiatives, i.e. Foundational Text and Skills, Informational Text, Speaking and Listening, Range Quality and Complexity, and Next Generation Science Standards NGSS
- Introduce technology and engineering through core subjects including: math, science, art, English
- Unleash students' creativity
- Increase STEM adoption, interest, and enrollment
- Provide a rich curriculum to maximize student engagement

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Tracking results

Examples to consider adding to your evaluation plan:

- % of students report a high level of interest in programming/engineering (survey)
- % of students report an interest in receiving information about related careers (survey)
- % enrollment increase in STEM-related courses/enrichment programs (enrollment data)
- % increase in knowledge of computer and technology skills (pre and post assessments)
- % increase in average AP Computer Science test score over previous years

Include a time period over which you will record this data.

If you have two or more classes, consider running a mini randomized, controlled trial. For a given concept, create two assignments - one using the micro:bit Kit, and one without. Give one class the micro:bit assignment and the other the regular assignment. Test their knowledge of the concept afterwards to directly evaluate both assignment completion rates and learning outcomes.

A rubric may prove to be a guide for your assessment, as many of the products of learning will be intertwined with intangible communication and problem-solving skills.

Developing a Budget

If your proposal does not already include a budget template, consider these typical expense categories.

Equipment/Tools/Manipulatives (fixed costs)

Consider costs for a set number of items that won't multiply with student exposure. These items will be things like micro:bit Kits, storage carts, laptops, Legos, craft paper, and tools (glue guns, hole punches, scissors).

1. micro:bit Base Kit

The kits cost $39.99 each, however one kit can serve many students over time. The cost per student decreases with each use. The conservative lifetime of equipment is three years, but we expect five years of use.

2. micro:bit Sensor Kit

The kits cost $18.00 each, however one kit can serve many students over time. The cost per student decreases with each use. The conservative lifetime of equipment is three years, but we expect five years of use.

3. micro:bit Motion Kit

The kits cost $27.99 each, however one kit can serve many students over time. The cost per student decreases with each use. The conservative lifetime of equipment is three years, but we expect five years of use.

Program Supplies (variable costs)

Consider costs for consumable items that multiply with student exposure. These items will be things like rechargeable AA batteries and craft materials (paper, felt, glue sticks, paper clips, crayons, cardboard, etc).

Training/Teacher Development Time

Staff training signals to funders that your program is structured for sustainability, rather than one-time, short-term experiences. Boolean Girl provides <u>free training and resources for teachers</u> from micro:bit lessons to Scratch, Python, and AI.

In-Kind Resources

Grant funders like to see that others are also supporting your project. Does your school/organization already have additional resources that will be of use for the program? Consider including teachers' time for course development, coordination, implementation, and evaluation. Are there batteries or art supplies that you'll be using that won't be purchased with this funding proposal? Do you have a provided (free) space in which you're running this class?

Indirect Costs

Consider including indirect costs when requesting funds, for example a portion of funding that equals 5-8% of the total costs. This functions as a safety net that can cover replacement parts, extra supplies, or unplanned events (e.g., higher than expected student enrollment).

Broaden the Impact

Some grants may require you to share your work or promote the funder after receiving a grant. Others may simply hope to see on your application that you have a plan for advertising the funded project as widely as possible. Here are a few examples for sharing your work:

- Display at an open house or information night for incoming students
- Contest/event where current students can present and explain their work to others (e.g. a science fair)
- Workshop for advanced students to teach beginner students how to use micro:bits
- Free outreach demonstration or class in the community by partnering with a local library or organization
- Letter to caregivers of students using micro:bit Kits that describes the awarded grant program and thanks the funder
- Article in a school newspaper/newsletter