BRING CREATIVE ROBOTICS INTO YOUR CLASSROOM

Grant Reference Guide

BirdBrain Technologies hopes to support you in serving students regardless of region, race/ethnicity, gender, socioeconomic status, or abilities. The following information aligns to common grant application questions and may be helpful as you compose a project proposal or prepare a justification for including robotics in your department budget. Please contact us with any questions.

Contents

COMPANY & PRODUCT DESCRIPTION

- **Mission**

  BirdBrain Technologies' mission is to inspire deep and joyful learning in all students through creative robotics.

- **History**

  Founded at Carnegie Mellon University in 2010, BirdBrain was created to promote gender equality and diversity in engineering and robotics. Products are designed to empower students to take ownership of their technical and creative skill sets, and engage in flexible problem-solving activities. Hundreds of thousands of students across the world have engaged with the Finch Robot or Hummingbird Robotics Kit.

- **Product Details - Hummingbird Robotics Kit**

  - The Hummingbird is a kit comprised of lights, motors, and sensors which allow students to build a personally meaningful robot out of ordinary craft/recycled materials. Developed at Carnegie Mellon's CREATE Lab and designed for students ages 10 and up, the Hummingbird Robotics Kit encourages open-ended, creative engineering and design projects.

  - Products resulting from the Hummingbird kit may be referred to as robots, kinetic sculptures, and animatronics.

  - This kit is compatible with several easy-to-use visual programming/coding environments such as Snap! and MakeCode, in addition to more difficult text-based programming languages such as Java and Python. The same kit offers a challenging, dynamic learning experience for both a 4th grader and college student. No prior experience with programming or engineering is necessary.

  - The Hummingbird kit is an excellent tool for cross-curricular, project-based learning experiences both in major subject classrooms (Math, English-Literature) and after school/enrichment programs.

  - Two to three students collaborate to bring a robot to life by designing a sculpture, engineering the mechanical movement, and engaging in computer programming.

Product Details - Finch Robot

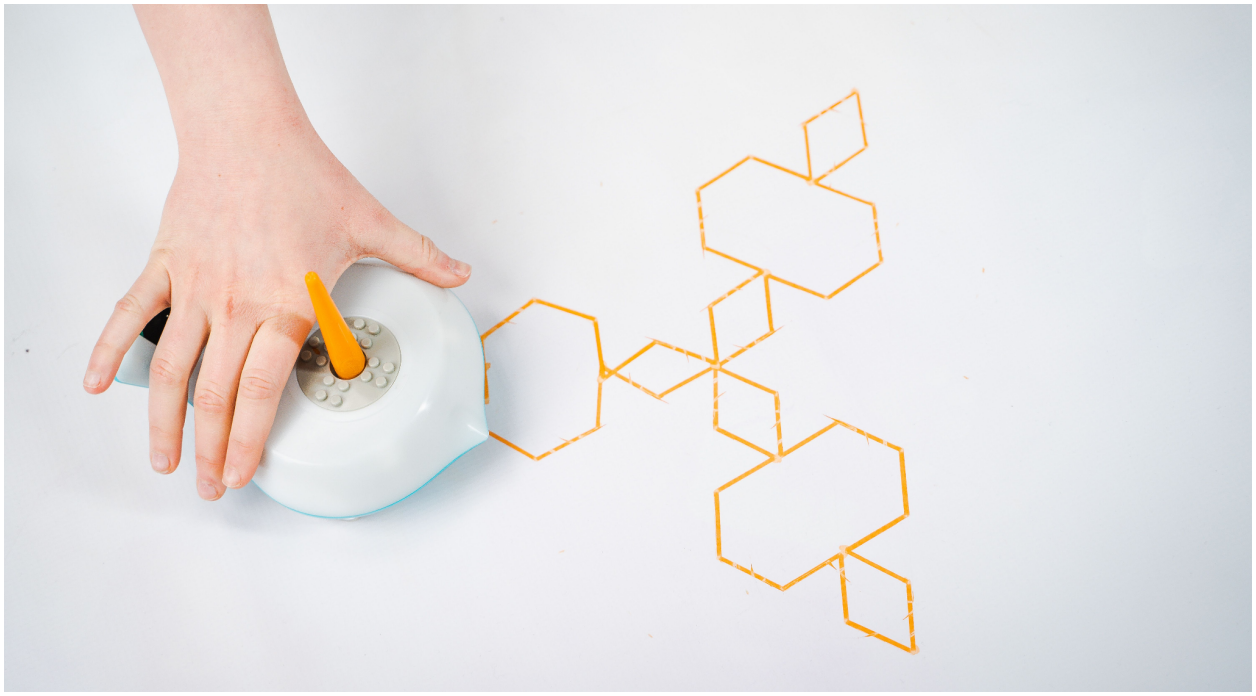
- Developed at Carnegie Mellon's CREATE Lab and designed for students ages 5 and up, the Finch is a pre-assembled robot that inspires and delights students learning computer science.

- The Finch Robot is equipped with 5 tri-color LEDs, a multi-tonal buzzer, wheel encoders, light sensors, distance/obstacle sensors, and line-tracking infrared sensors. Through the micro:bit it also has a compass, accelerometer., buttons, and radio function. With the right program, the Finch can transform into a buzzing, moving alarm clock, a joystick for a student-written game, a musical instrument, a light-fearing robot, and much more!

- Finch is compatible with several easy-to-use visual programming/coding environments such as Snap! and MakeCode, in addition to more difficult text-based programming languages such as Java and Python. The same robot offers a challenging, dynamic learning experience for both a kindergartner and college student. No prior experience with programming is necessary.

- The Finch Robot has a rechargeable battery that lasts 7+ hours. It is robust and portable.

- The Finch Robot comes with free lessons and activity ideas.



IDENTIFYING NEED

Statistics strengthen your passionate message with evidence. Whether you're working to increase access to computer science (CS) for rural, urban, or underrepresented communities of students -- or simply to increase the number of students involved in CS within your community, you'll find the most current data at Code.org.

Use these resources to find meaningful data that supports your request for funding:

- Code.org's open letter supporting CS
- Code.org's summary of policy changes by state helps you align your proposal to projects at the state level

IDENTIFYING IMPACT

Impacts on Learning - Hummingbird Robotics Kit

- *Connect learning with real-world applications*
  Students explore computer science and engineering design processes with a purpose/product as a goal. Students have built robotic model homes with novel features to withstand natural disasters after empathizing with pen pals in Ecuador. Students have designed biomimetic robots that solve global challenges (e.g. a dolphin that uses its nose to dig for trash in the ocean).

- *Apply knowledge in new, challenging ways*
  Students can demonstrate their learning in a core subject. Students may design their interpretation of the scenes within a poem, recreate a moving muscle system, or model motion within the solar system.

- *Engage underrepresented groups in STEM*
  Research shows that between elementary school and high school, interest in STEM subjects declines significantly, especially for girls and underrepresented groups. The Hummingbird Kit is designed to increase engagement in STEM, especially in these groups, by offering creative ownership and access for those without prior experience.

Impacts on Learning - Finch Robot

- *Apply knowledge in a cross-curricular way*
  With the included sensors and software support, the Finch Robot lends itself to cross-curricular learning at many levels! The AP Computer Science class can make great use of the Finch during the entire length of the course. The Finch can also be used in standard math and science classes for shorter experiences. For example, computer science students could write data-collecting programs and that data can be both used in science class experiments and analyzed in math class. One class set of Finches can impact multiple classrooms at one period of time!

- *Make complex, on-screen practice hands-on to increase comprehension*
  The Finch Robot is an excellent tool to relay the following concepts (you'll find these on our Finch Java and Python pages): Basic input and output, variables, conditionals, loops, arrays, using and creating objects/classes, methods/functions, mathematical operations, boolean logic, and the program development cycle.

MEASURING SUCCESS

Many funding proposals must include a way to demonstrate success. The first place to start is to show how your proposal aligns to goals set by your school/district/state. Then you'll want to include specific measurable outcomes.

Aligning to Standards

- The Hummingbird Robotics Kit and Finch Robot can be integrated in a wide variety of core courses with activities that connect to the following national standards: 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
  - Increase and improve kinesthetic learning activities in the classroom
  - Introduce technology and engineering through everyday project-based subjects like Poetry, English, Art, History, Geology, Human Anatomy, etc.
  - Unleash students' creative imaginations
  - Increase STEM/STEAM adoption, interest and enrollment
  - Provide a rich curriculum in order to maximize student engagement

- Follow this link to see what actions your state is taking toward embracing Computer Science, and how you can align to those goals!

Measurable Outcomes

- Examples you may consider adding to your evaluation plan:

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

- If you have two or more classes, consider running a mini randomized, controlled trial (the gold standard in evaluation research). For a given concept, create two assignments - one using Finch, and one without. Give one class the Finch assignment and the other the regular assignment. Test their knowledge of the concept afterwards. You can directly evaluate both assignment completion rates and learning outcomes!

- Be sure to include a time period over which you will record this data.

- Many of the products of learning will be intertwined with intangible communication and problem-solving skills. For that reason, you'll most likely develop a rubric to guide your formative assessment. Feel free to refer to our Computational Thinking and Engineering Design assessment guides for inspiration!

DEVELOPING A BUDGET

If your proposal does not already include a budget template, we suggest you 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 Finches or Hummingbird Kits, storage carts, chromebooks, extension cords, and tools (glue guns, hole punches, scissors).

- Hummingbird Kit
  Generally, the kits cost $119 to $219/robot. However, consider that $119 - $219 in grant funds will serve many students over time. Each robot is always designed by a group of 2-3 students, student users rotate, and kits travel from classroom to classroom. The cost per student decreases

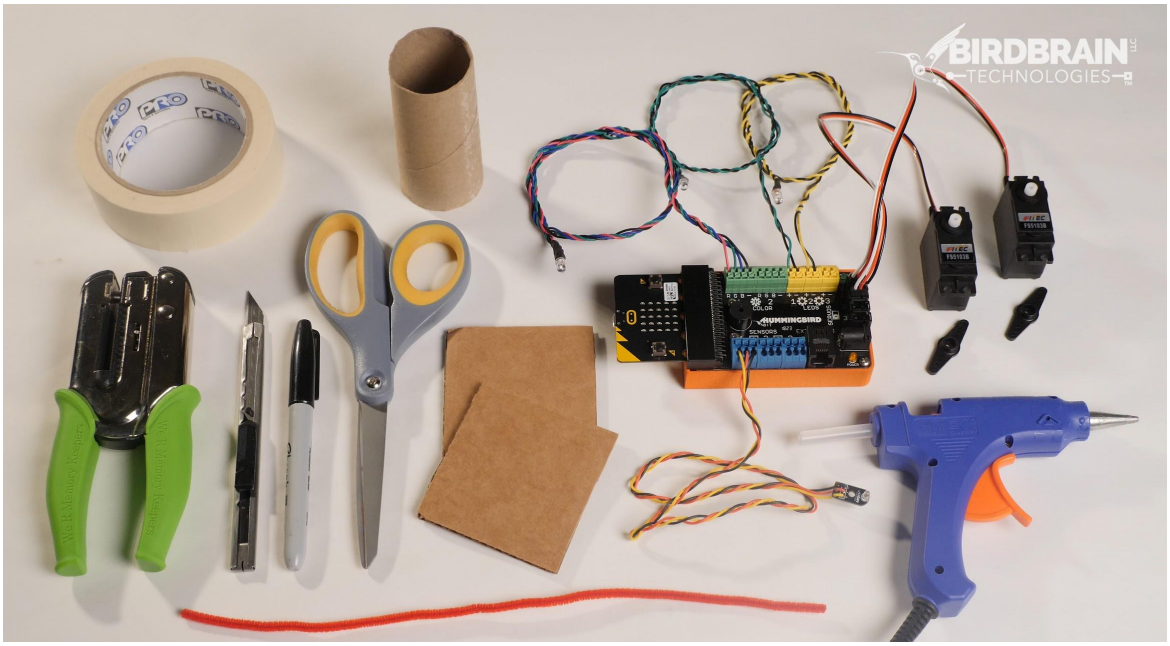
with each use. The conservative lifetime of equipment is 3 years, but we expect 5-10 years of use. You'll find our exact pricing at our online store.

When determining how many kits you need, remember that 1 controller = 1 robot. All of our product descriptions list how many controllers are in each kit. Next, consider that you'll group 2-3 students per robot.

- Finch Robot
  Finches cost $149/robot. However, consider that $149 in grant funds will serve many students over time. Each robot can be programmed by a group of 2 students, student users rotate, and Finch flocks travel from classroom to classroom. The cost per student decreases with each unit or school year. The conservative lifetime of equipment is 3 years, but we expect 5-10 years of use. You'll find our exact pricing at our online store.

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, brads, styrofoam balls, cardboard, etc).



Training/Teacher Development Time

Consider how adding the cost of professional training to your proposal would set your team up for success! The inclusion of staff training also signals to a funder that your program is structured for sustainability, rather than one-time, short-term experiences. BirdBrain offers various levels of support from a 1-hour webinar to a multi-day hands-on training. Email PD@birdbraintechnologies.com for more information.

- **In-Kind Resources**
  When someone volunteers to give you a service, supplies, or free help, you're receiving in-kind support. Grant funders like to see that others are also supporting your project. What resources does your school/organization already have that will be of use for the program? Consider listing 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 enrichment program or class?

- **Indirect Costs**
  When requesting funding from a foundation, consider including indirect costs: a portion of funding that equals 5-8% of the total costs. This sum is a sort of safety net that often pays for replacement parts, extra supplies, or unplanned events (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 Finch/Hummingbird
- Free outreach demonstration or class in the community by partnering with a local library or organization

- Letter to caregivers of students using Finch/Hummingbird that describes the awarded grant program and thanks the funder
- Article in a school newspaper/newsletter

NOTE ON DONORS CHOOSE

We know that so many teachers seek out classroom support through Donors Choose, and we hear from many when they don't see the Finch Robot or Hummingbird Kit listed as an item to add to their project. Here's what we know:

- **Special Request Projects**
  BirdBrain Technologies' tools can only be fundraised for with a Special Request Project. This is not ideal. The requirements lead us to believe that you'll have to have at least 2 projects funded before you can start a Special Request Project. It's a big hurdle for all teachers, but especially those new to Donors Choose.

- **Vendor Directory**
  The vendor directory for regular Donors Choose projects is quite small. We've tried to become a vendor, but it's not possible within the current system. One of our authorized resellers, Carolina Biological, is listed in the vendor directory, but from what we understand they offer a limited catalog of products to Donors Choose and BirdBrain Technologies' classroom tools are not included.

We hope that this changes in the future and it becomes easier for teachers to seek out support for new/unique classroom tools within Donors Choose. Until then, you can consider starting a Special Request Project and reaching out to Donors Choose customer support with questions on earning points.