Northeastern University
University Scholars Program

Northeastern University
Office of Undergraduate Research & Fellowships

Bits & Bots

The Black Engineering Student Society and the Boston Public Library
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Why We Do This

- 7th and 8th grade students of low socioeconomic status report low interest in STEM careers
- Race and gender gaps persist in computer science education
- Job growth in computer and information science sectors outpace all other major job sectors.
- Boston Public Schools contain large school-to-school discrepancies in graduation rates, varying between 50-90% depending on region.

Who We Are

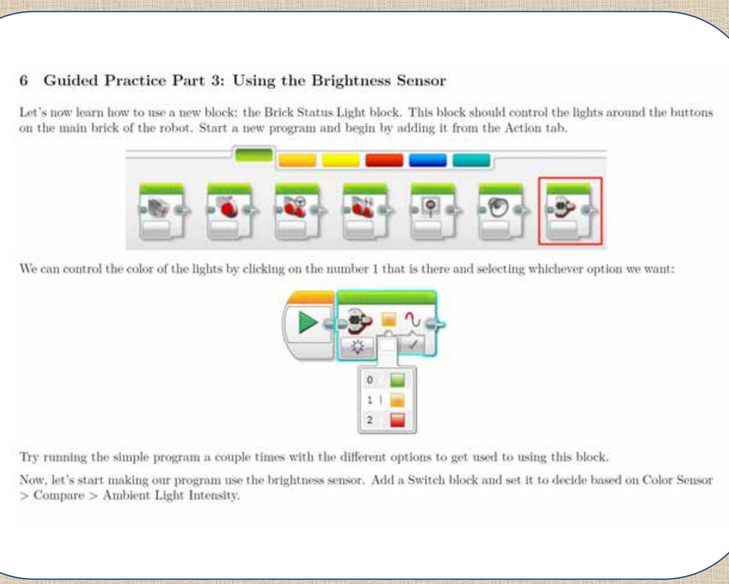
We are a team of Northeastern Students passionate about promoting interest and education in STEM fields to all, regardless of socioeconomic status. We plan, design, and execute computer science curriculum for elementary and middle school students in the greater Boston area.

Aims

1. Develop modular lesson plans that can allow easy integration of computer science curriculum into existing programs
2. Create and maintain a presence in after school programs at Grove Hall Public Library
3. Generate student interest in STEM fields and higher education.
4. Create accessible options for educators who want to include computer science curriculum in their education programs.

Methods

1. Develop lesson plans
2. Teach lesson plans during 60-90 minute sessions for approximately 8 weeks each semester
3. Score Students comprehension, interest, and behavior during lesson
4. Using gathered observations, change aspects of future lessons and continue to gather data



6 Guided Practice Part 3: Using the Brightness Sensor

Let's now learn how to use a new block: the Brick Status Light block. This block should control the lights around the buttons on the main brick of the robot. Start a new program and begin by adding it from the Action tab.

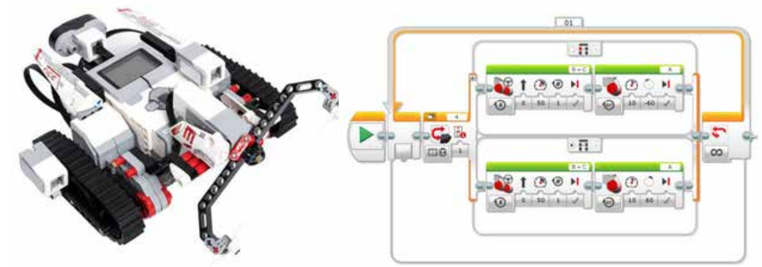
We can control the color of the lights by clicking on the number 1 that is there and selecting whichever option we want:

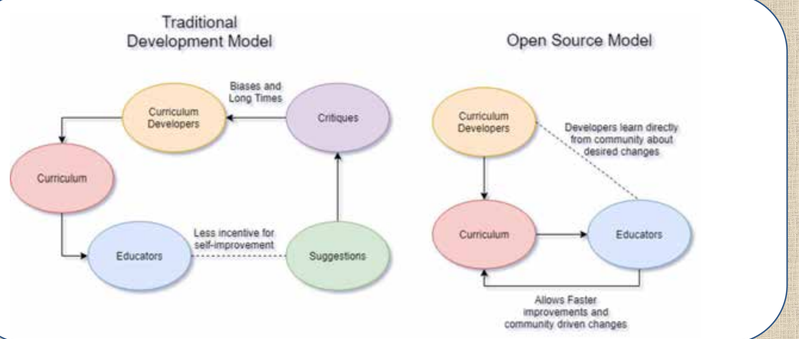
Try running the simple program a couple times with the different options to get used to using this block.

Now, let's start making our program use the brightness sensor. Add a Switch block and set it to decide based on Color Sensor > Compare > Ambient Light Intensity.

Lego Mindstorms EV3

- Lego Robot were chosen as a accessible medium for young students to grasp computer science concepts.
- Mindstorms programming contains the following logical concepts (all included in Bits & Bots Curriculum)
  - Looping
  - Conditional Statements
  - Enumerations
  - Basic Wiring
  - Sequential Ordering
  - Responding to sensor input
  - Logic statements





Conclusions & Looking Ahead

- Continuing modular lesson development
- Expanding Service to multiple branches of the Boston Public Library.
- Increasing membership by collaborating with other organizations in and off the Northeastern Campus
- Increasing public knowledge of our open source curriculum, and listening to community voices to determine how to improve.

References: Niu, Lian. (2017). Family Socioeconomic Status and Choice of STEM Major in College: An Analysis of a National Sample. College student journal. 51. 298-312.
Guynn, Jessica. "Google: Race, Gender Gaps Persist in Computer Science Education." USA Today, Gannett Satellite Information Network, 18 Oct. 2016, www.usatoday.com/story/tech/news/2016/10/18/google-gallup-computer-science-girls-blacks-hispanics/92335498/.
"Summary." U.S. Bureau of Labor Statistics, U.S. Bureau of Labor Statistics, 12 Apr. 2019, www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm.
Weiner, Michael. "Addressing Inequality through K-12 Education in Boston." *Pioneer Institute*, Michael Weiner Http://Pioneerinstitute.org/Wp-Content/Uploads/Logo_440x96.Png, 23 Mar. 2016, pioneerinstitute.org/education/addressing-inequality-through-k-12-education-in-boston/.