

STEM LEAPS/PULL

**Introduction to Robotics with
Raspberry Pi and BrickPi**

July 2019

The STEM Program

Law
Enforcement
And
Public
Safety

Public
Utilities
Learning
Labs

Our classes were small part of the annual STEM (Science, Technology, Engineering and Math) week-long training programs for local high school students developed by STEP (Science and Technology Education Partnership), Riverside Unified School District, Riverside Police, City of Riverside Fire Department, and Riverside Public Utilities. The classes were hosted at Bourns Technology Center in Riverside.

We did 3 training sessions, one for each breakout group:

- Fire
- Police
- Public Utilities

10-20 students per class session

The Robotics Class

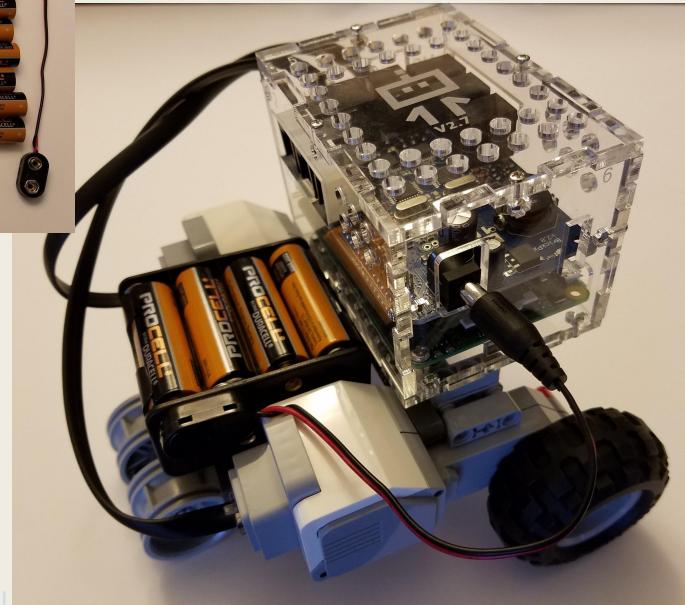
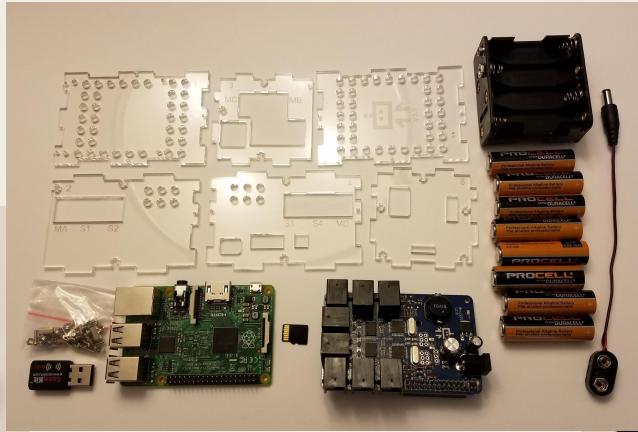
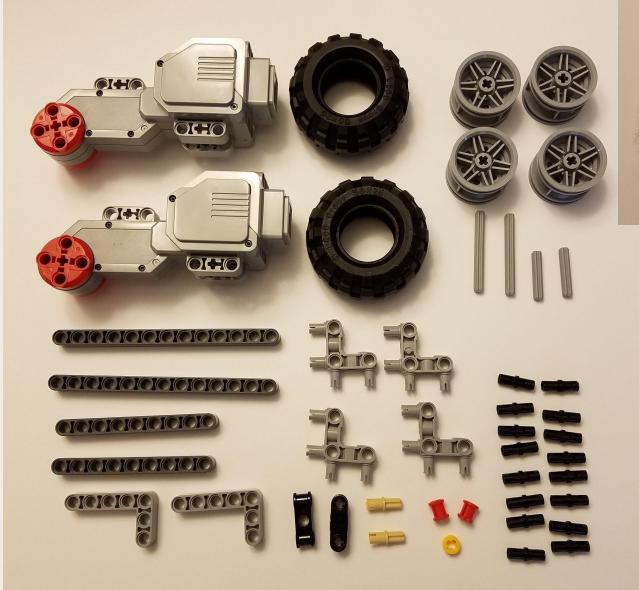
The class is designed to give students hands-on experience in building and programming a simple robot.

- Based on LEGO Technics bricks and Mindstorm EV-3 motors
- Raspberry Pi platform combined with a Dexter BrickPi module
- Programming done with Scratch on the Raspberry Pi
- Robot kits are intended to be reused (this was the 4th year)

Concepts covered include:

- What is a “robot”?
- Where are robots used (Dull, Dirty, Dangerous)
- Robot components (physical platform, computer/electromechanical, software)
- Breaking big complex problems down into small easier to solve modules

The Hardware



The Software

The image displays three software windows side-by-side, illustrating the Scratch programming environment and its integration with robotics.

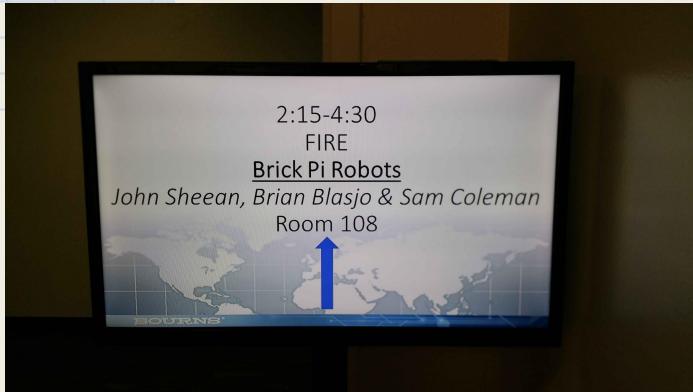
Scratch Project Window: The leftmost window shows a Scratch script titled "Following_Arr". It contains several key pressed events for movement and broadcast control. Key highlights include:

- Up arrow:** Broadcasts "join MB speed" and "join MC speed".
- Left arrow:** Broadcasts "join IMB 0" and "join IMC 0".
- Space:** Broadcasts "join MB 0" and "join MC 0".
- Right arrow:** Broadcasts "join MB 0" and "join MC 0".
- Down arrow:** Broadcasts "join MB -1 * speed" and "join MC -1 * speed".
- F key:** Sets speed to speed + 10.

Scratch for Robots Window: The middle window, titled "ManullTest2", shows a robot sprite with a speed of 100. A large black arrow points upwards on the stage. The window includes a sidebar with various robot-related icons and buttons like "Software Update", "shutdown", "Backup Files", "Wifi Setup", "Follower calibration", "Scratch", "Advanced communication", and "Test and troubleshoot".

Scratch Controller Window: The rightmost window, titled "Scratch for Robots", features the Dexter Industries logo. It includes a dropdown menu for selecting a robot ("BrickPi"), buttons for "Start Programming", "Open Examples", "Update GoBox", "About", "Demo Hardware", and "Exit". A note at the bottom cautions: "Caution: Do not close the Scratch Controller window running in the background right now."

The Sessions



The Sessions



The Sessions



Resources

- Science and Technology Education Partnership:
<http://myscienceeducation.com>
- STEM LEAPS Learning Labs
https://www.bourns.com/docs/about-us/community-outreach/bourns_stem_leaps_recap_article_c1636.pdf
- Bourns Community Outreach
<https://www.bourns.com/support/about-us/community-outreach>
- Dexter BrickPi
<https://www.dexterindustries.com/brickpi/>