Brad Miller

Associate Director, WPI Robotics Resource Center

Look at some robots that are available

Give a preview of what we're doing today

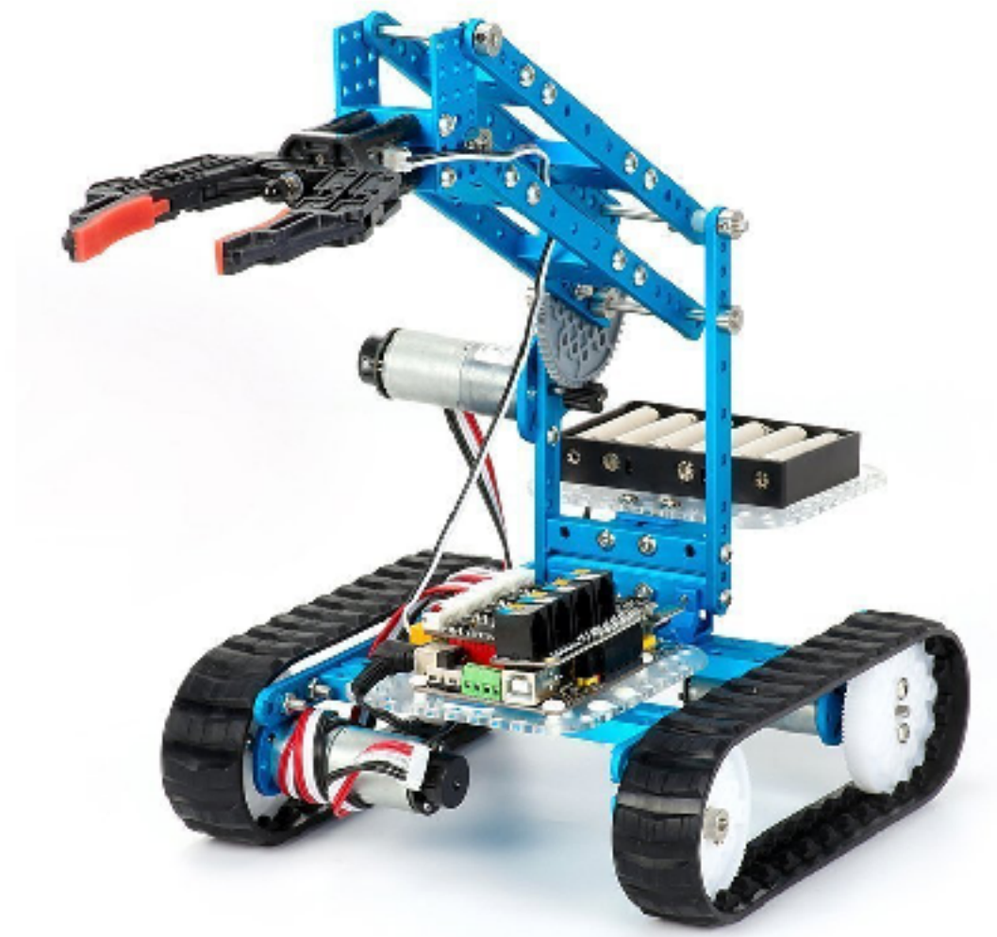
mBot

- Can be assembled in 10 minutes
- Drag and drop graphical programming language or C
- Arduino compatible controller

$95 (although just saw it for $56.99)

mBot Ultimate

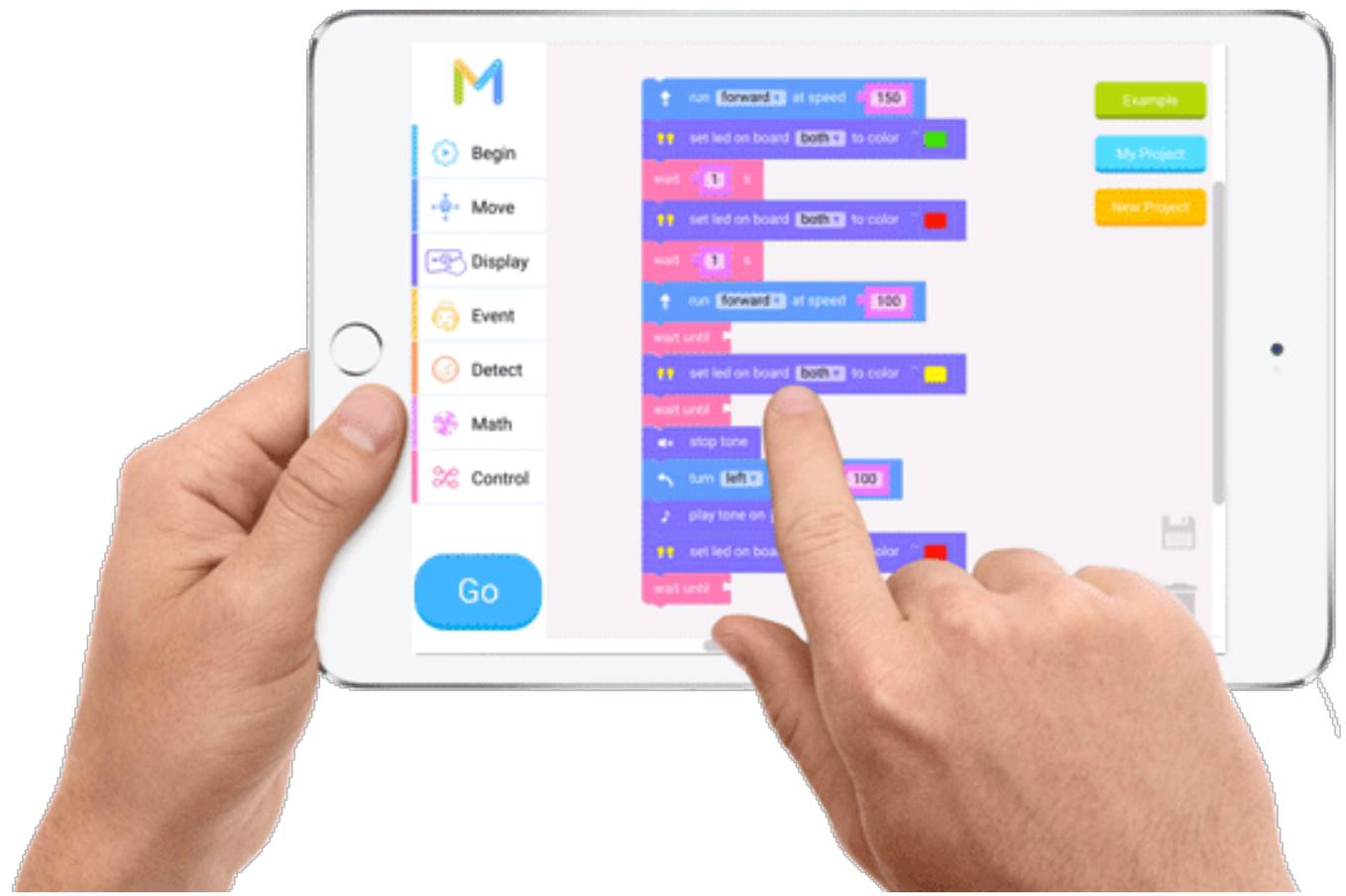
- Instructions for building 10 different robot designs
- Arduino controller
- Graphical programming or C



about $400

Graphical programming

- Graphical programming language based on “Scratch”



Lego Mindstorms EV3

- Very popular among younger students
- The basis of *FIRST* Lego League
- Drag and drop language, C, or Java available
- Used in our summer classes

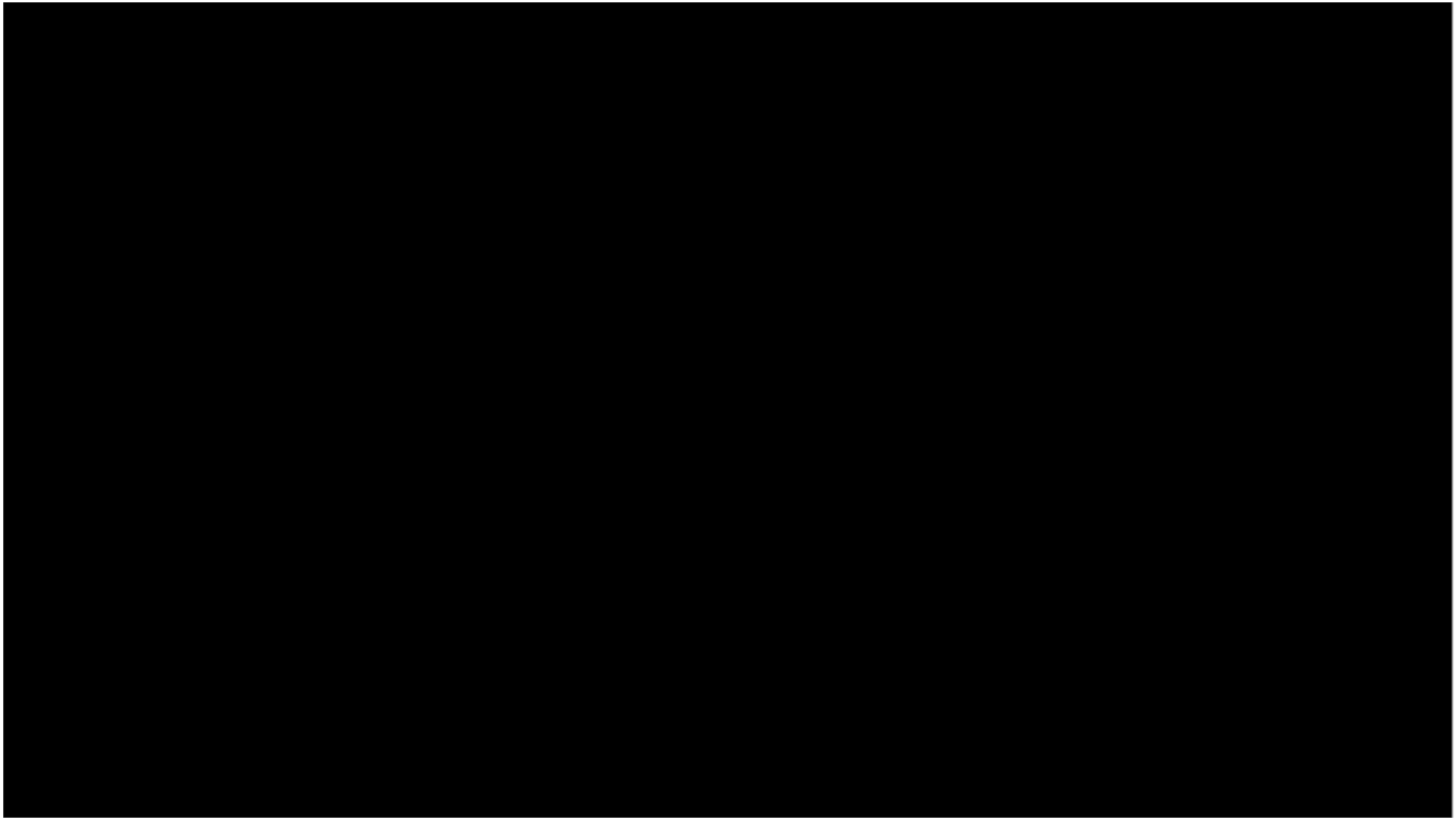
Not just a toy

- Used in my Object Oriented Programming class
- College sophomore level

VEX Robots

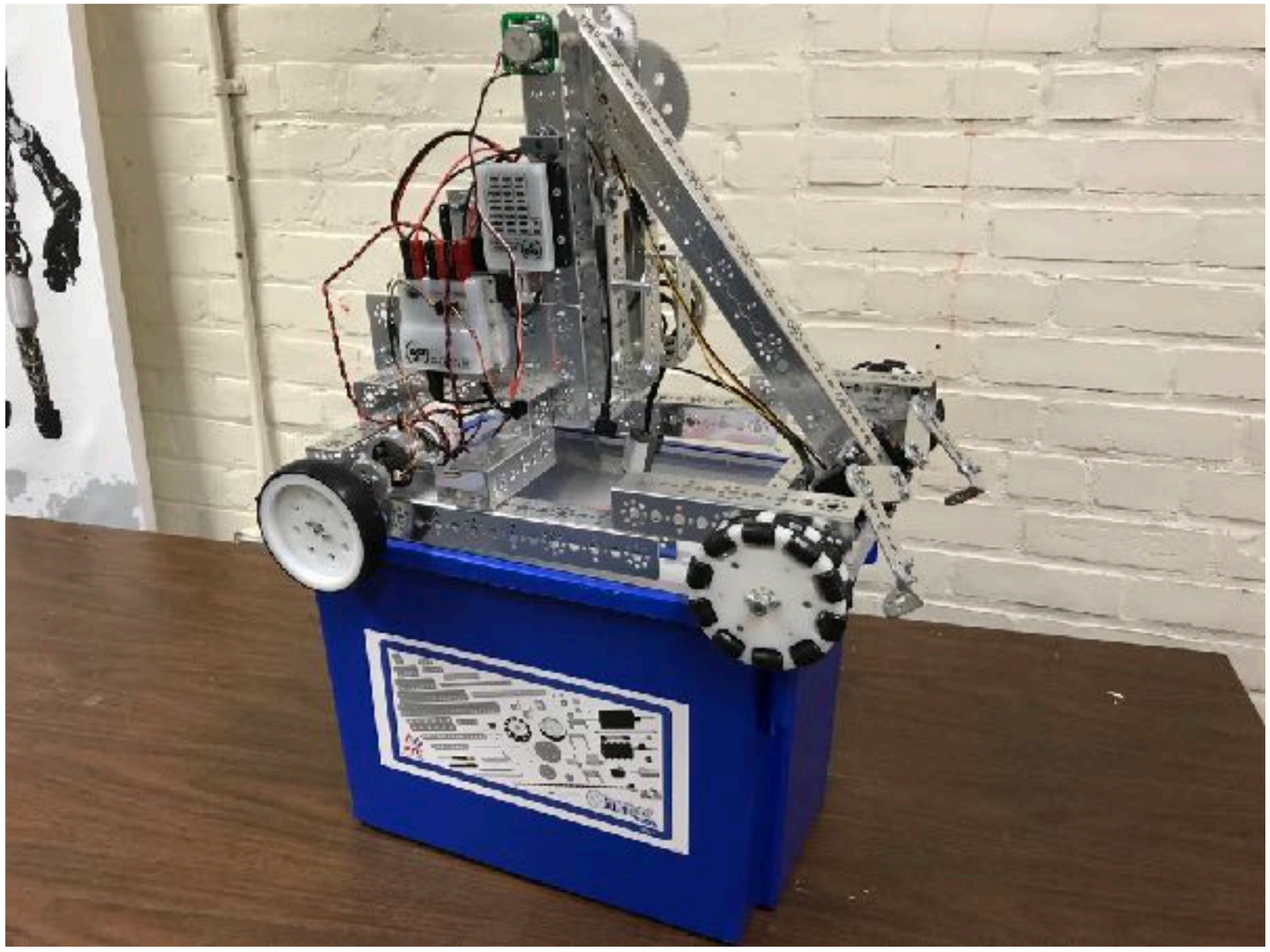
- Very popular robot system
- Lots of curriculum available
- VEX competition has over 12,000 teams worldwide
- Kit starts at about $500

Vex Robotics



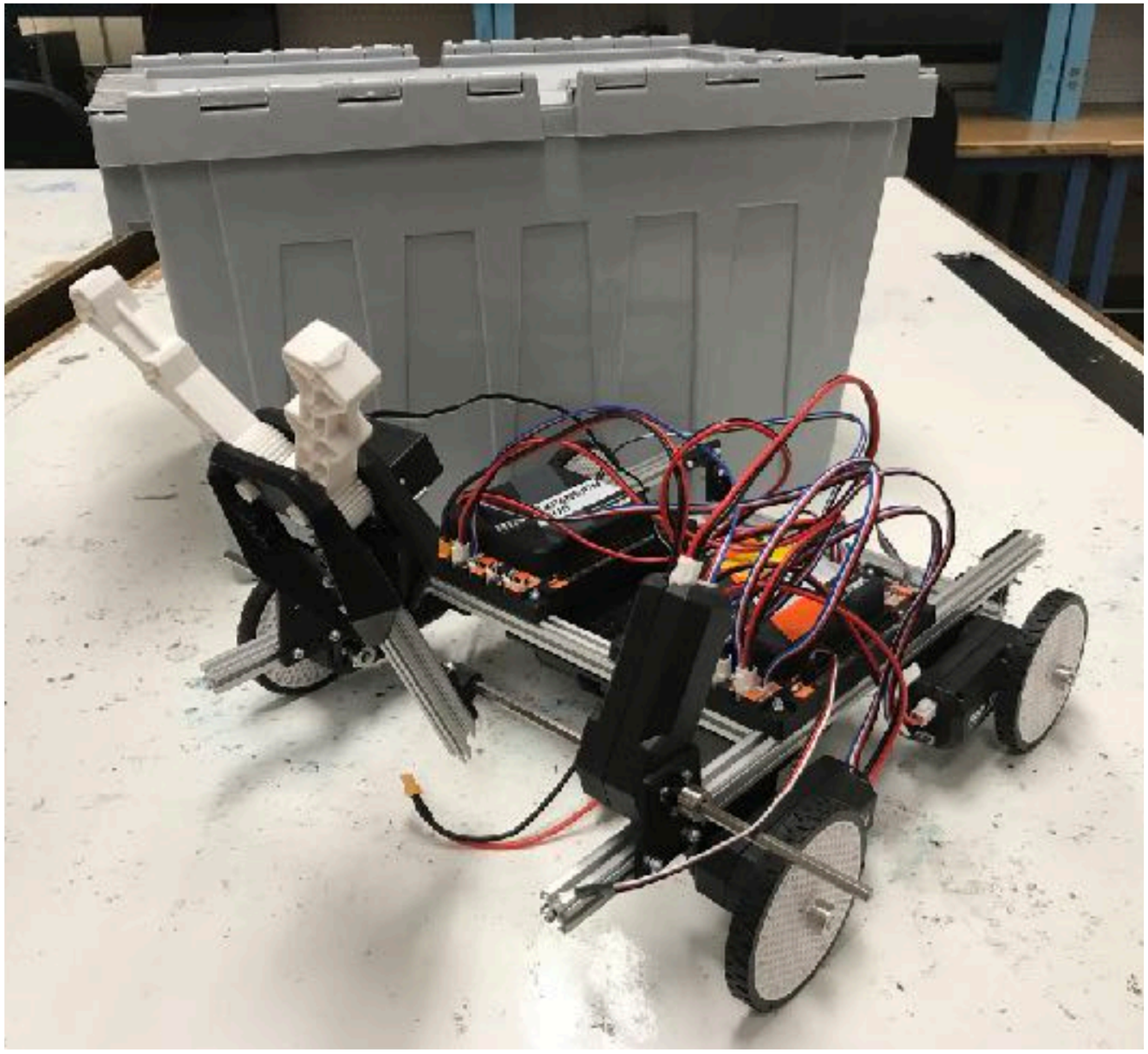
FIRST Tech Challenge

- FTC for grades 7-12
- Robots use Android phones for “brain”
- Programmed with Java or Scratch
- First season cost is about $2,250 ($1000 for the kit) for US teams - less after



FIRST Global

- New program started this year based on Olympic model - world competition with 1 team from each country
- Standard kit of parts
- This year, 1 team per country, in future, countries have local competitions to pick their champion to represent them
- Over 150 countries



Today’s sessions

Curriculum Development

- We’re developing robotics curriculum as an extension of the MS4SSA program
- Based on low cost components
- And a “cloneable” set of materials based on the Canvas Learning Management System (LMS) available for no charge

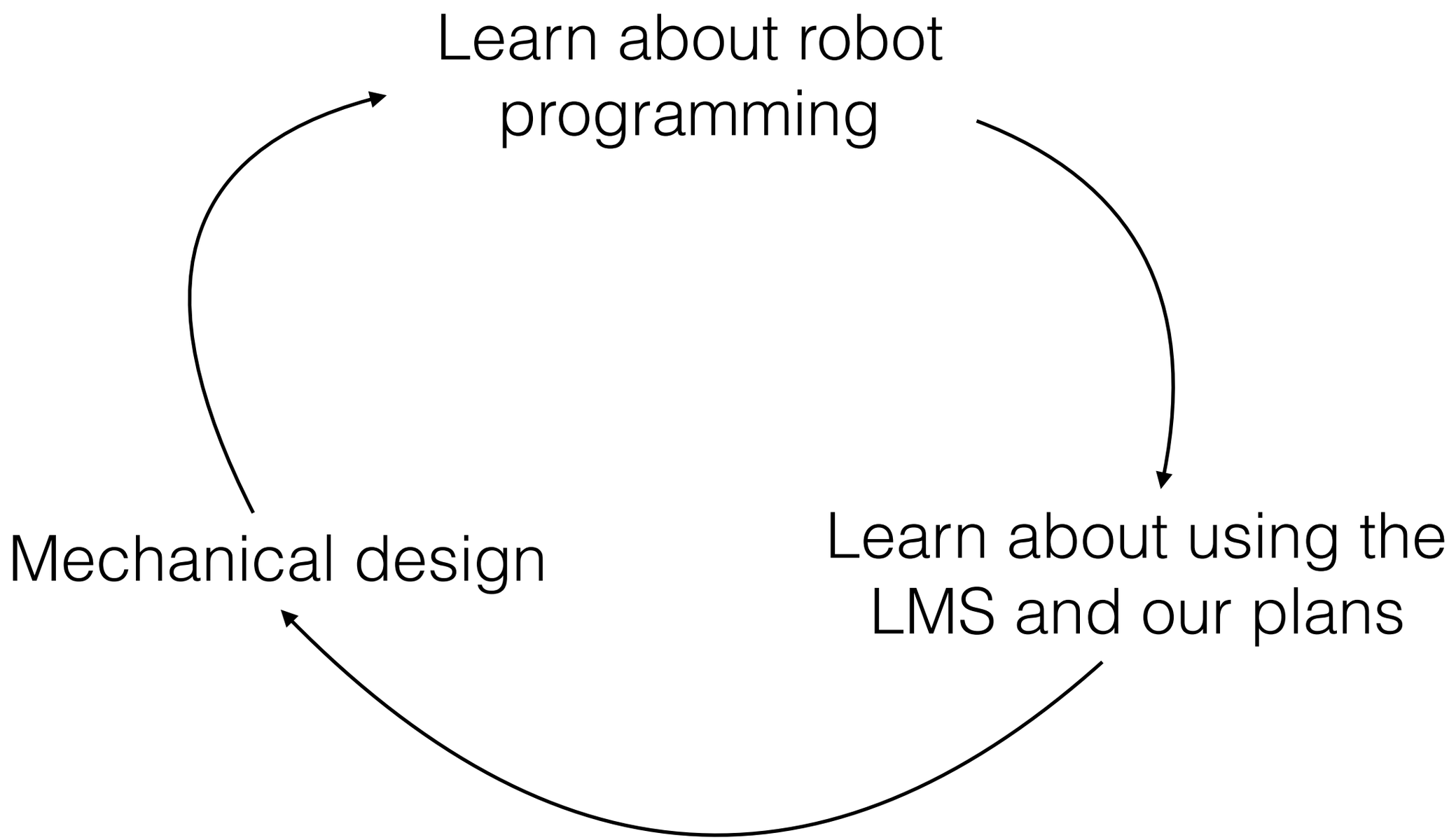
Today’s Goal

- Give you a taste of what the materials will look like
- Make you the student to let you experience what they will experience
- Using VEX robot parts with an Arduino controller - that’s what we use at WPI

We’ve only been working on this for a few weeks so it’s very preliminary

Today’s plan

You’ll be in 3 groups and rotate between these activities



Programming

- You'll learn how to program a robot in the C language with an Arduino as the controller
- You'll learn now to control the robot movement based on a 2-wheel drive system
- You'll learn how to use a sensor to make the robot drive to a desired distance from an object and stop
- You'll learn very basic control theory

Mechanical

- Practice creating accurate free-body diagrams and calculating the associated forces and torques
- Understand driveline speed/torque transmission effects
- Describe the design considerations involved in determining the optimal transmission ratio for given design objectives
- Utilize motor torque, power and speed curves to predict driveline performance

Robotics Education in Africa

- Learn about the Canvas-based robotics course that we intend to make available to all of you
- Discuss opportunities for use of robotics in Africa as a way of inspiring youth to pursue careers in STEM fields
- Showcase existing robotics programs on the continent and what we can learn from them
- Have an open discussion on how you would go about implementing a robotics program in your country