THE EDUCATION FUND 40 YEARS

FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

2024
2025

Ideas with IMPACT

Technology

Expanding VEX Robotics Programs with Schoology

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Contents

Goals and Objectives:

- Understanding Robotics Fundamentals:
    - Equip teachers with foundational knowledge of robotics concepts, including hardware components, sensors, and one of the software used to code the VEX robots.

- Integration of Robotics in Curriculum:
    - Enable teachers to integrate robotics into their curriculum effectively, enhancing student engagement and learning outcomes.

- Hands-on Robotics Project Development:
    - Empower teachers to develop and facilitate hands-on robotics projects that foster problem-solving and critical thinking skills among students.

- Professional Development and Collaboration:
    - Foster a community of practice among teachers to support ongoing professional development and collaboration in robotics education.

Florida Standards:

ELA.8.C.1.4: Write expository texts to explain and analyze.

ELA.8.R.2.1: Analyze how individual text sections and/or features convey a purpose and/or meaning in texts.

MA.K12.MTR.2.1: Demonstrate understanding by representing problems in multiple ways.

MA.K12.MTR.6.1: Assess the reasonableness of solutions.

SC.68.CS-PC.2.2: Explain the possible consequences of cyberbullying and inappropriate use of social media on personal life and society.

SC.68.CS-PC.2.3: Describe the influence of access to information.

SC.K2.CS-CS.2.2: Solve age-appropriate problems (e.g., puzzles and logical thinking programs) with or without technology (i.e., computational thinking).

SC.K2.CS-CS.2.3: Solve real life issues in science and engineering using computational thinking.

SC.K2.CS-CS.4.3: Explain that a computer program is running when a program or command is executed.

Course Overview and Outline by Module:

This comprehensive VEX Robotics course equips teachers with the tools and knowledge to guide students through an engaging and educational robotics experience. Designed for educators with no prior robotics experience, the course provides a structured framework to introduce students to the exciting world of STEM through VEX IQ.

Course Structure:

The course is divided into nine modules, each building upon the previous one. This ensures a smooth learning progression and allows students to master essential concepts before diving deeper.

Module 1: Getting Started

- Introduction to VEX IQ Robotics
- Overview of course structure and learning objectives
- Familiarization with VEX IQ components (motors, gears, sensors, etc.)

Module 2: Exploring the Drivetrain Assemblies

- Exploring different drivetrains
- Understanding gear ratios and their impact on robot movement
- Building different drivetrain configurations using VEX IQ parts

Module 3: Building the First VEX IQ Robot

- Following step-by-step instructions to assemble a basic VEX IQ robot
- Using construction tools safely and effectively
- Troubleshooting common building problems
- Introducing robot design principles

Module 4: The Controller

- Functionality of the VEX IQ controller
- Connecting the controller to the robot brain
- Basic navigation and setup of the controller

Module 5: Device Setup

- Connecting motors and sensors to the robot brain
- Configuring motors and sensors using the VEXcode software

Module 6: Programming Movements

- Introduction to block-based programming using VEXcode
- Programming basic robot movements (forward, backward, turning)
- Utilizing loops and conditional statements to create complex movements
- Debugging and troubleshooting basic programming errors

Module 7: Programming the Sensors

- Exploring various VEX IQ sensors (distance, touch, light)
- Programming robots to react to sensor data (e.g., stop at obstacles)
- Utilizing sensor data to control robot behavior in different scenarios
- Experimenting with sensor combinations for complex interactions

Module 8: The Game

- Introduction to the VEX IQ Competition game (Rapid Relay: 2024-2025)
- Understanding game objectives, scoring rules, and field elements
- Designing and programming a robot to perform specific game tasks
- Strategies for successful competition participation

Module 9: Final Assessment

- Students showcase their final VEX IQ robots and their functionalities
- Assessment based on robot design, programming skills, and problem-solving abilities
- Open discussion and reflection on the learning experience

LESSON PLAN

Module 1: Getting Started with VEX IQ Robotics

1.1 Discussion: What is one thing you are excited about learning in VEX IQ?

1.2 Objectives:

- Identify how to access VEXCode IQ
- Identify what firmware is and how to update the Robot's firmware
- Understand how to charge the Robot's battery

1.3 Exploration

	App-based VEXcode IQ	Web-based VEXcode IQ
Platforms Supported	iPads, Android Tablets, Amazon Fire Tablets, Mac, Windows	Chromebooks, macOS, and Windows (with Chrome-based browser)
Internet Connectivity Required?	No (Windows and Mac) Yes (iPad, Android Tablet, Amazon Fire)	Yes, via codeiq.vex.com
Auto-Save Projects?	Yes	No, projects must be manually saved
Firmware Update in VEXcode IQ?	Yes (2nd gen only)	Yes (2nd gen only)

1.4 Charging the VEX IQ Battery

Show the students how to charge the battery. The USB-C cord must be plugged into a power source to charge the battery. The battery's indicator lights will flash while it is charging.

1.5 Updating the Firmware

Each update of VEXCode IQ will require the latest version of the VEXos firmware installed on the Brain before user programs can be downloaded.

Module 2: Exploring the Drivetrain and Assemblies

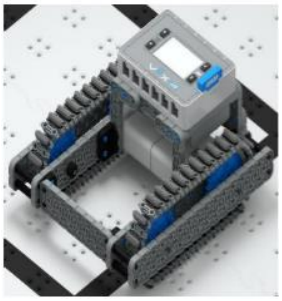
2.1 Discussion: Which robot would you like to build?

2.2 Objectives:

- Learn how to select the Drivetrain
- Understand and explore passive assemblies
- Understand and explore motor-driven assemblies

2.3 Selecting a VEX IQ Drivetrain

A drivetrain is sometimes referred to as a drive base. Identifying which kind of drivetrain to use is one of the first considerations when designing a robot.

Standard Drivetrain	H Drive	Holonomic (three wheels)	Track Drive
			

2.4 Understanding passive assemblies

Passive assemblies use no motors. Designing a passive assembly allows the robot's motors to be used for additional functions.

2.5 Understanding motor-driven assemblies

Passive assemblies use motors. Typically, motor-driven assemblies take more time and planning to put together that passive assemblies.

Module 3: Building the First VEX IQ Robot

3.1 Discussion: Reflection on what they have learned so far.

3.2 Objectives:

- Explore different robot builds
- Explore tips for assembling and disassembling pieces

- Select and build a VEX IQ Robot

3.3 Selecting a VEX IQ Build
Students can choose additional VEX IQ builds to view and download. Each model build includes instructions

3.4 Tips for assembling and disassembling

3.5 Build your VEX IQ Robot

Module 4: The Controller

4.1 Objectives:
- Execute the required steps to pair and calibrate the VEX IQ Controller
- Understand the pre-requisites to add the controller to the VEXCode IQ setup
- Review how to setup the controller in VEXCode IQ.

4.2 Introducing the controller
Before you can use the controller, you need to pair the controller with the robot brain. Pairing is the process to connect the controller to the brain so that the controller can communicate with it wirelessly

Power on the Brain and Controller

Install the Battery and select the Check button to turn on the Brain.
Press the Power button to turn on the Controller.
The Brain's LED and the Controller's Power/Link LED should display green to show that they are powered on.

4.3 Pairing and calibrating the VEX IQ controller
The calibration will ensure proper functionality

4.4 Your turn to explore

Module 5: Device Setup

5.1 Discussion: How many motors and sensors are you planning to have?

5.2 Objectives:

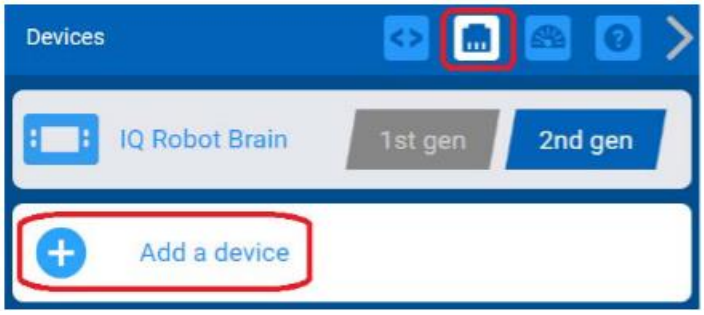
- Identify how to use a device to access VEXCode IQ to make configurations
- Identify how to configure Drivetrains, Smart Motors, Controllers, and Sensors

5.3 VEXCode IQ Blocks: Getting Started Tutorial

VEX IQ Blocks are puzzle-piece shaped blocks that connect above or below each other and are used to program. There are five different shapes of blocks, and each shape tells you about its role in the project. (Hat, Stack, Booloean, Reporter, and C – blocks)

5.4 Your Turn: Device Setup: Drivetrain

(1) Open the Device Window and select “Add a device”



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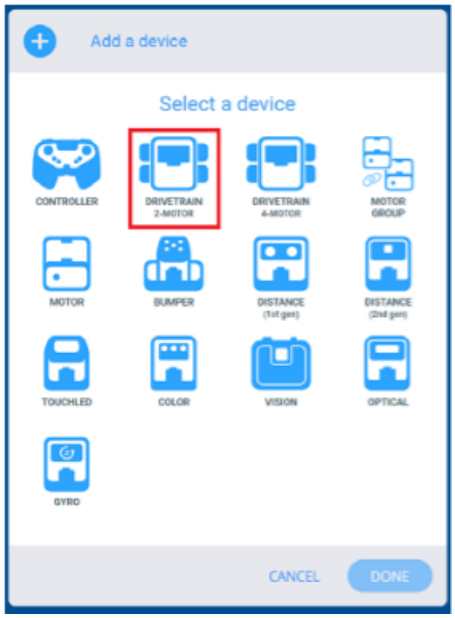
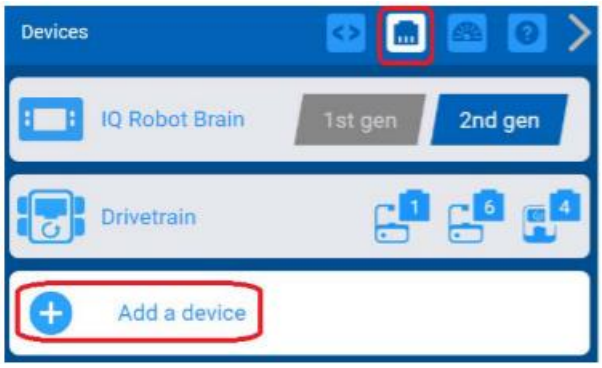
(2) Select the 2-Motor Drivetrain (most robots have the 2-Motor Drivetrain)

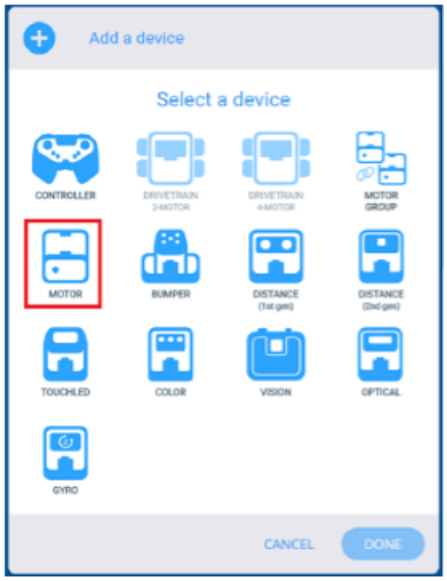


5.5 Your Turn: Device setup: Smart Motors

(1) Open the Device Window and select “Add a device”

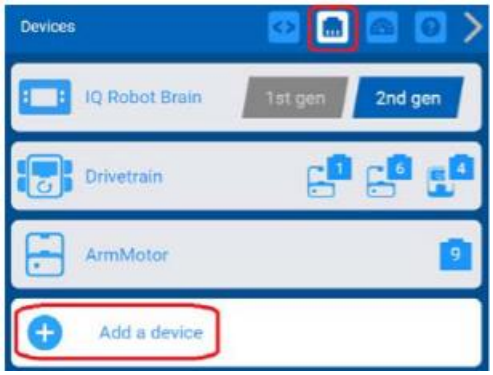


(2) Choose “Motor”



5.6 Your Turn: Device Setup. Controller

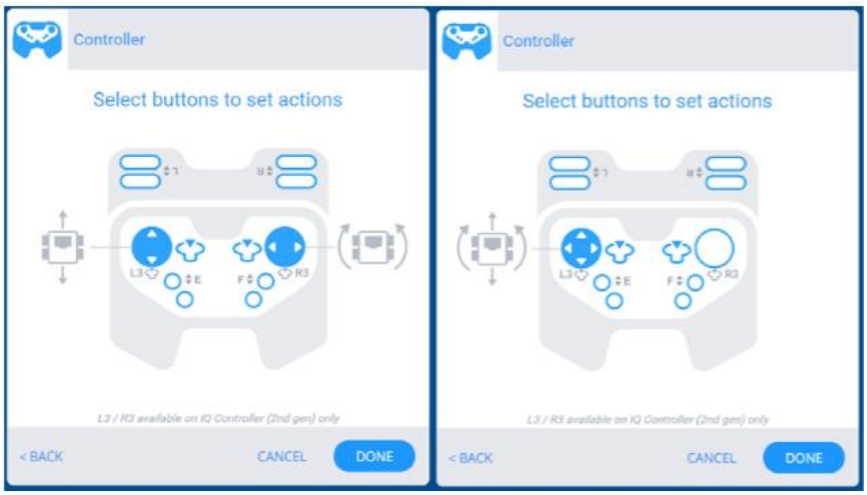
(1) Open the Device Window and select “Add a device”



(2) Choose “Controller”

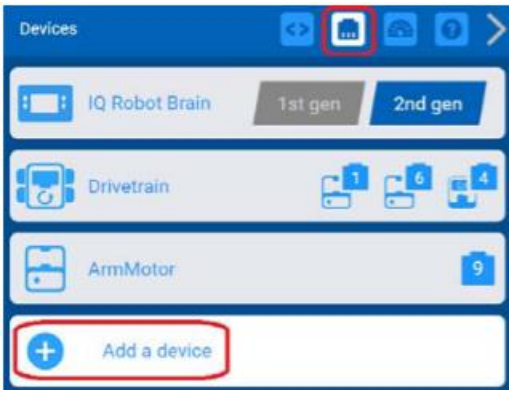
(3) Assign motors to buttons on the controller by selecting the buttons to use:

(4) Change the drive mode of the robot by selecting the joysticks

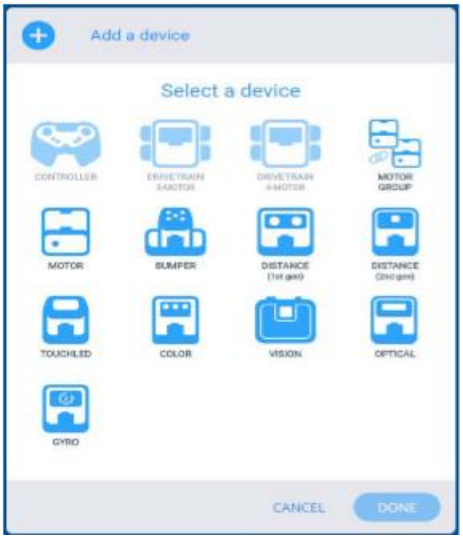


5.7 Your Turn: Device Setup. Sensors

(1) Open the Device Window and select “Add a device”



(2) Select the sensor you want to use: Bumper, Distance, Touched LED, Color, Vision, Optical, or Gyro



5.8 Assessment. Have students complete a multiple-choice assessment.

Module 6: Programming Movements

6.1 Discussion: How fast do you want your robot to move?

6.2 Objectives:

- Code the Drivetrain using the Drive for block to drive a robot forward and backward for a specific distance
- Code the Drivetrain using the Turn for block to program a robot to turn left or right
- Use the Spin and Set blocks from the Motion category to move the motors
- Explain how velocity impacts Robot movements and how to adjust velocity in the project
- Create a project that sequences Robot behaviors to solve a challenge

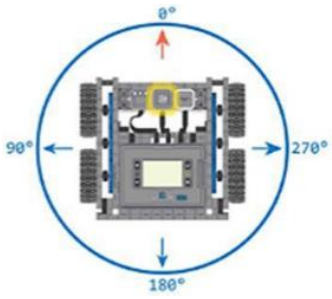
6.3 VEXCode IQ: Coding Drivetrain Movement

6.4 How to Program Forward and Reverse

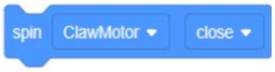
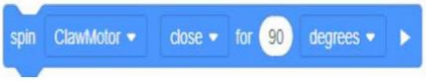
There are two different drivetrain blocks to program forward and reverse for a robot: “Drive” and “Drive for”

6.5 How to program Turns

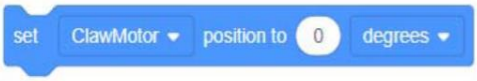
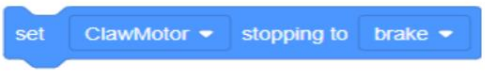
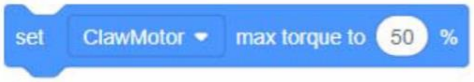
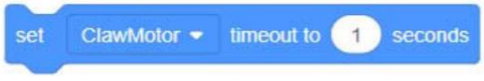
There are four different ways to Turn: “Turn”, “Turn for”, “Turning to heading”, “Turn to rotation”



6.6 How to program the Motors (Spin)

Spin	
Spin for	
Spin to position	
Stop motor	

6.7 How to program the Motors (Set)

	Set a motor position
	Set a motor velocity
	Set motor stopping
	Set motor torque
	Set motor timeout

Module 7: Programming the Sensors

7.1 Discussion: Which sensor would you like on your robot?

7.2 Objectives:

- Identify all the sensors
- Understand the function of each sensor
- Understand how to set up each of the sensors
- Understand each of the blocks available for each of the sensors
- Explore and discuss program samples using each of the sensors
- Create programs using each of the sensors

7.3 Programming the Bumper Switch Sensor

Bumper Switch

Function:

- Tells the robot whether its bumper is pressed (sensor value of 1) or released (sensor value of 0).

7.4 Programming the Distance Sensor

Distance Sensor

Function:

- Detects if there is an object in front of it
- Measures the distance between itself and an object
- Determine the relative size of a object
- Reports the velocity of an object

7.5 Programming the Touch LED Sensor

Touch LED

Function:

- Can detect capacitive touch, such as the touch of a finger.
- Can be set to display many colors.

7.6 Programming the Optical Sensor

Function:

- Detect the color of an object
- Detect an object
- Detect the brightness level of ambient light
- Measure the numerical Hue Value of an object
- White LEDs on the sensor can provide a consistent light source when detecting colors regardless of the surrounding light conditions.

7.7 Discussion: If you were to pick just one sensor for your robot, which one would you pick and why?

Module 8: The Game

8.1 Objectives:

- Explore the VEX IQ competition season
- Learn game definitions
- Understand the rules of the competition and how to score points
- Build and code a VEX IQ Robot to be able to play and score points on the competition field

Module 9: Final Assessment

- Students showcase their final VEX IQ robots and their functionalities
- Assessment based on robot design, programming skills, and problem-solving abilities
- Open discussion and reflection on the learning experience

RESOURCES LIST

https://vr.vex.com
https://codeiq.vex.com/
https://pd.vex.com
https://dadeschools.schoology.com