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ROBOTICS

Coding with VEX 123

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VEX 123

Marcelle Farley
mfarley@dadescschools.net

VEX 123 is an interactive, programmable robotics platform designed to introduce young learners to basic STEM concepts through hands-on activities. It enables students to develop critical thinking, problem-solving, and coding skills by programming the robot to perform various tasks and challenges. VEX 123 fosters creativity, collaboration, and a foundational understanding of technology, making learning both engaging and fun for early elementary students.

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Goals:

1. **Develop Fundamental STEM Skills:**
    - Gain a basic understanding of science, technology, engineering, and mathematics (STEM) concepts.
    - Apply problem-solving skills to real-world scenarios.
2. **Enhance Coding and Programming Skills:**
    - Learn basic programming concepts such as sequences, loops, and conditionals.
    - Understand how to use block-based coding to control a robot's movements and actions.
3. **Foster Teamwork and Collaboration:**
    - Work effectively in teams to plan, design, and execute projects.
    - Communicate ideas clearly and listen to team members' contributions.
4. **Cultivate Critical Thinking and Problem-Solving:**
    - Analyze problems and develop creative solutions using the VEX 123 platform.
    - Experiment with different programming sequences to achieve desired outcomes.
5. **Encourage Creativity and Innovation:**
    - Design and build unique robotic projects.
    - Explore various ways to use sensors and other components to enhance the robot's functionality.

Objectives:

1. **Understand the Basics of Robotics:**
    - Identify the main components of the VEX 123 robot.
    - Explain how each component contributes to the robot's overall function.
2. **Learn Basic Programming Concepts:**
    - Write simple programs to control the robot's movements using block-based coding.
    - Use loops and conditionals to create more complex behaviors.
3. **Complete Hands-On Projects:**
    - Follow step-by-step instructions to complete predefined projects.
    - Design and implement a custom project using the skills learned.
4. **Debug and Troubleshoot Programs:**
    - Identify common programming errors and learn strategies to fix them.
    - Test and refine programs to improve their accuracy and efficiency.
5. **Engage in Reflective Practices:**
    - Reflect on what was learned during each project or activity.
    - Document the challenges faced and how they were overcome.
6. **Participate in Competitions and Challenges:**
    - Prepare for and participate in VEX robotics competitions or challenges.
    - Apply skills in a competitive setting to test problem-solving abilities under pressure.

By setting these goals and objectives, students can have a structured and meaningful learning experience with VEX 123, gaining valuable skills that extend beyond robotics and coding.

Florida Standards:

Mathematics Standards:

1. **MA.K.NSO.1.1:**
    - **Benchmark:** Recite numbers from 0 to 20 in the correct order and recognize numerals 0 to 20.
    - **VEX 123 Connection:** Students can program the VEX 123 robot to move a certain number of steps, counting aloud as it moves.
2. **MA.K.GR.1.1:**
    - **Benchmark:** Identify and describe 2-dimensional shapes such as circles, triangles, rectangles, and squares.
    - **VEX 123 Connection:** Students can use VEX 123 to navigate around shapes on the floor or create shapes using the robot's movements.
3. **MA.K.DP.1.1:**
    - **Benchmark:** Sort and classify objects into given categories; count the number of objects in each category.
    - **VEX 123 Connection:** Students can program the VEX 123 robot to sort objects into categories based on attributes like color or shape.

English Language Arts Standards:

1. **ELA.K.C.1.1:**
    - **Benchmark:** Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.
    - **VEX 123 Connection:** Students can work in pairs or groups to discuss and plan the programming of their VEX 123 robot.
2. **ELA.K.V.1.1:**
    - **Benchmark:** Identify new meanings for familiar words and apply them accurately (e.g., knowing duck is a bird and learning the verb to duck).
    - **VEX 123 Connection:** Introduce students to new vocabulary related to robotics and programming, such as "code," "sequence," and "algorithm."
3. **ELA.K.C.2.1:**
    - **Benchmark:** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts about a topic.
    - **VEX 123 Connection:** Students can draw and describe their VEX 123 projects, explaining the steps they took to program the robot.

Science Standards:

1. **SC.K.P.10.1:**
    - **Benchmark:** Observe that things that make sound vibrate.
    - **VEX 123 Connection:** Students can explore how the VEX 123 robot makes sounds and discuss the vibrations that produce them.
2. **SC.K.P.12.1:**

- **Benchmark:** Investigate that things move in different ways, such as fast, slow, etc.
- **VEX 123 Connection:** Students can program the VEX 123 robot to move at different speeds and in different directions.

3. **SC.K.P.13.1:**
    - **Benchmark:** Observe that a push or a pull can change the way an object is moving.
    - **VEX 123 Connection:** Students can use the VEX 123 robot to demonstrate how pushing and pulling can change its movement.

Computer Science Standards:

1. **CSTA K-2.1A-AP-09:**
    - **Benchmark:** Model the way programs store and manipulate data by using numbers or other symbols to represent information.
    - **VEX 123 Connection:** Students can program the VEX 123 to respond to different inputs, such as pressing buttons to initiate movement sequences.
2. **CSTA K-2.1A-AP-11:**
    - **Benchmark:** Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.
    - **VEX 123 Connection:** Students can test their VEX 123 programs and make adjustments to correct any errors in the robot's behavior.

Overview:

Educational robotics empowers students by giving them ownership over their learning, enhancing engagement and motivation through real choices in the classroom. By integrating VEX 123, students can leverage their strengths and meet their learning needs, fostering a sense of autonomy, capability, and relatedness. This project engages primary grade students in hands-on robotics activities, introducing coding concepts through touch-based controls for movement and sound with the VEX 123 robot.

Students from PreK to 1st Grade will learn about the VEX 123 Robot's features and functions by following along with "Meet Your Robot," a read-along story, and establishing best practices with a set of classroom Robot Rules. By using touch buttons to code the 123 Robot, students will develop their reading skills by sounding out and reading words. As they advance their coding skills, students will progress to more complex robots, continuing their journey in educational robotics.

VEX 123 Activities:

1. Robot Maze Navigation:

- **Objective:** Students will program the VEX 123 robot to navigate through a maze.
- **Materials:** Tape to create a maze on the floor, VEX 123 robots.
- **Activity:** Students will work in pairs or small groups to plan and program the robot to move through the maze from start to finish. They can use trial and error to debug and improve their programs.

2. Shape Tracing:

- **Objective:** Students will learn about different shapes and practice programming the robot.
- **Materials:** Large paper or mats with shapes drawn on them (circle, square, triangle, etc.), VEX 123 robots.
- **Activity:** Students will program the robot to trace the outlines of different shapes. They can count the steps and turns needed for each shape, reinforcing their understanding of geometry.

3. Number Line Game:

- **Objective:** Students will practice counting and number recognition.
- **Materials:** Number line mat (0-10), VEX 123 robots, number cards.
- **Activity:** Students draw a number card and program the robot to move to the corresponding number on the number line. They can also practice simple addition or subtraction by moving the robot forward or backward along the number line.

4. Story Time Coding:

- **Objective:** Students will integrate literacy and coding.
- **Materials:** "Meet Your Robot" read-along story, VEX 123 robots.
- **Activity:** After reading the story, students will program the robot to act out parts of the story. For example, if the story says the robot needs to move to a certain location, students will code the robot to perform that action.

5. Robot Relay Race:

- **Objective:** Students will practice teamwork and coding skills.
- **Materials:** Cones or markers to set up a course, VEX 123 robots.
- **Activity:** Students will form teams and program the robot to move from one marker to the next. The team that programs their robot to navigate the course the fastest wins. This activity encourages collaboration and strategic thinking.

6. Color Sorting:

- **Objective:** Students will practice sorting and categorization.
- **Materials:** Colored mats or paper, objects of different colors, VEX 123 robots.
- **Activity:** Students will program the robot to move objects to matching colored mats. For example, they can program the robot to push a red block to the red mat, a blue block to the blue mat, etc.

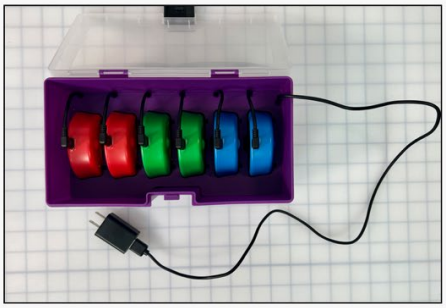
7. Sound and Movement Sequence:

- **Objective:** Students will explore sequences and patterns.
- **Materials:** VEX 123 robots.
- **Activity:** Students will program a sequence of movements and sounds. For example, they might code the robot to move forward, turn, make a sound, and repeat. This helps students understand the concept of sequences in coding.

8. Alphabet Adventure:

- **Objective:** Students will practice letter recognition and sequencing.
- **Materials:** Alphabet mats or cards, VEX 123 robots.
- **Activity:** Students will program the robot to move from one letter to the next in alphabetical order. They can also spell simple words by programming the robot to move to the corresponding letters.

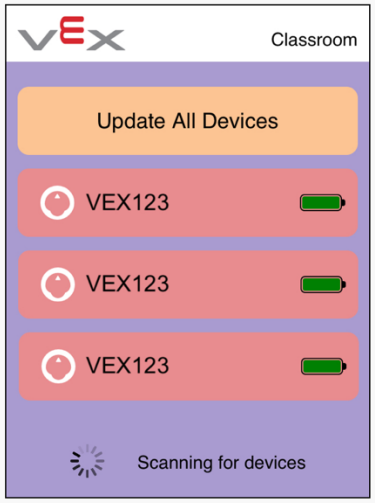
Getting Started



Begin by charging the VEX 123 Robots. Plug each robot in using the cables within the storage case as shown here.

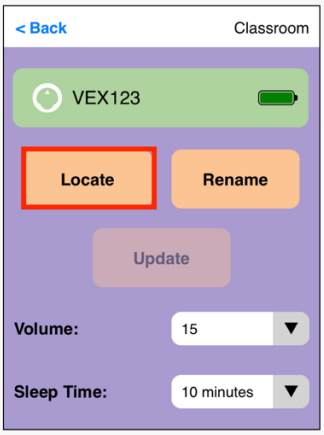
Label your VEX 123 Robots and VEX Coders. Use a sticker label or piece of tape and a marker for labeling. It is recommend to name the 123 Robots and Coders the same names so it is easy to distribute robots and Coders to your students.

It is recommended that you place the label for the 123 Robot on the bottom of the robot between the wheels. It can be difficult to place a label on the top without obscuring the Touch buttons.



Open the VEX Classroom App. You should see all of the 123 Robots that are currently turned on listed inside of the app.

The default name for the robots is "VEX123."

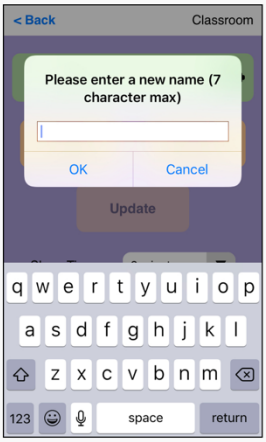


After the robots have been updated, you can begin to name the devices so that their labels match their name within the VEX Classroom App and VEXcode 123.

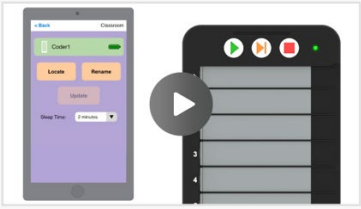
To begin, open the first 123 Robot in the list and **locate** it. For more information on how to locate a 123 Robot in the Classroom App, see this article.

Have fun with the names! You can name them based off of storybook characters, relate the names to the color of the robots, or base the names on what your students are currently learning about in class. In this example, the robots and Coders are named after fruit.

You will notice that the VEX Coders also have their labels on the back. It is recommended to put the labels on the back so students are not distracted by the names of their robot and Coder and to help minimize students removing the labels.



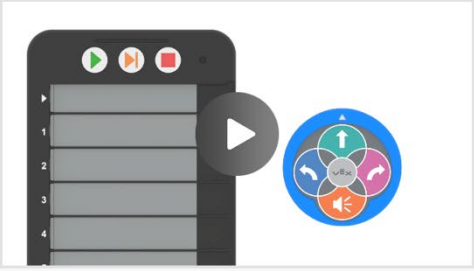
After locating the 123 Robot, rename it to match the label.



The same steps for locating and renaming a Coder can be followed. Locate and name each Coder to match its label.

For more information about locating and renaming VEX Coders, see this article.

Pairing 123 Robots and Coders



Now that all robots and Coders have been named, they can be paired together. Find the robot and Coder with the matching label and follow the steps in this article to pair them.

Kindergarten Math Lesson Plan: Counting and Number Recognition with VEX 123

Lesson Title: Counting and Number Recognition with VEX 123

Grade Level: Kindergarten

Duration: 45 minutes

Objectives:

- Students will recognize and identify numbers 0-10.
- Students will count objects and match the corresponding number.
- Students will program the VEX 123 robot to move a specific number of steps corresponding to the number they identify.

Materials:

- VEX 123 robots
- Number cards (0-10)
- Counting objects (e.g., blocks, beads)
- Floor mat with numbered squares (0-10)
- Whiteboard and markers
- Student journals or paper
- Crayons or markers

Standards:

- **MA.K.NSO.1.1:** Recite numbers from 0 to 20 in the correct order and recognize numerals 0 to 20.
- **MA.K.DP.1.1:** Sort and classify objects into given categories; count the number of objects in each category.

Vocabulary:

- Number
- Count
- Program
- Sequence
- Robot

Introduction (10 minutes):

1. **Hook:**
    - Show the students the VEX 123 robot and explain that today they will be using it to help with counting and number recognition.
2. **Discussion:**
    - Review numbers 0-10 with the students using number cards. Hold up each card and have the students say the number aloud.
    - Ask students to count aloud from 0 to 10 as a group.

Direct Instruction (10 minutes):

1. **Demonstration:**
    - Place the VEX 123 robot on a floor mat with numbered squares.
    - Show the students how to program the robot to move a certain number of steps by pressing the appropriate buttons.
    - Demonstrate programming the robot to move to a specific number (e.g., 3 steps to land on the number 3).
2. **Guided Practice:**
    - Select a few students to come up and help program the robot to move to different numbers on the mat. Encourage the class to count the steps aloud together.

Activity (15 minutes):

1. **Small Group Work:**
    - Divide the students into small groups and provide each group with a VEX 123 robot, number cards, and counting objects.
    - Each group will draw a number card, count out the corresponding number of objects, and then program the robot to move that many steps on the mat.
    - Circulate around the room to assist groups as needed and ensure they are correctly programming the robot.

2. **Extension Activity:**
    - For students who complete the main activity quickly, challenge them to program the robot to move in a sequence of two numbers (e.g., move 2 steps, then 3 more steps).

Closing (10 minutes):

1. **Review:**
    - Bring the class back together and ask each group to share one thing they learned about counting and programming the robot.
    - Review the numbers 0-10 again and ask students to identify numbers on the number cards.
2. **Reflection:**
    - Have students draw a picture in their journals of the robot moving to their favorite number. Ask them to write the number they chose (or have an adult help them).
    - Encourage students to explain their drawing to a partner.

Assessment:

- Observe students during the activity to ensure they can correctly count objects and program the robot.
- Check student journals for accurate number recognition and corresponding drawings.

Differentiation:

- For students needing extra support, provide additional practice with counting objects and identifying numbers.
- For advanced students, introduce simple addition or subtraction problems using the robot (e.g., start at 5, move back 2 steps).

Resources:

Where to purchase Vex 123	https://www.vexrobotics.com/123
Vex 123 STEAM Labs	https://education.vex.com/stemlabs/123