Goals and Standards

Implementing VEX GO STEM Labs

STEM Labs are designed to be the online teacher's manual for VEX GO. Like a printed teacher's manual, the teacher-facing content of the STEM Labs provides all of the resources, materials, and information needed to be able to plan, teach, and assess with VEX GO. The Lab Image Slideshows are the student-facing companion to this material. For more detailed information about how to implement a STEM Lab in your classroom, see the Implementing VEX GO STEM Labs article.

Goals

Students will apply

- How to plan and start a VEXcode GO project that makes the Code Base robot complete a dangerous, dirty or dull task.

Students will make meaning of

- How to create a project with the Code Base robot and VEXcode GO that mimics real world challenges for robots in the workplace.
- How robots can do jobs that are dirty, dull or dangerous; such as unsanitary work cleaning sewers, dull work in warehouses, or dangerous work fighting fires.

Students will be skilled at

- Planning and starting a project using VEXcode GO.
- Describing their project plan with another group.
- Creating a sequence of Drivetrain commands together so the Code Base robot can complete a task.

- Identifying and explaining a robot job that is either dirty, dull, or dangerous.

Students will know

- How to correctly sequence Drivetrain commands in a VEXcode GO.
- How to plan and start a project with the Code Base robot and VEXcode GO that mimics real world challenges for robots in the workplace.

Objective(s)

Objective

1. Students will identify the behaviors needed in order for the Code Base robot to complete a challenge.
2. Students will use VEXcode GO to create a project that solves a real-world challenge.
3. Students will identify how a Code Base robot is completing a task that is either dirty, dull, or dangerous.

Activity

1. In Play Part 1, students will create a project plan that identifies the behaviors needed to complete the challenge.
2. In Play Part 2, students will use VEXcode GO to create and test their solutions.
3. In Play Part 1, students will work collaboratively to identify a scenario for their challenge activity.

Assessment

1. Students will create a project plan using a Blueprint Worksheet in Play Part 1, and share their plan with the teacher during the Mid-Play break.
2. Students will create and test their solution for the teacher during Play Part 2.
3. Students will write out their scenario in Play Part 1 and share with the teacher during the Mid-Play Break section.

Connections to Standards

Showcase Standards

Common Core State Standards (CCSS)

CCSS.MATH.CONTENT.K.G.A.1: Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

How Standard is Achieved: Students will have to describe the movement of the Code Base robot (relative to the goals of the challenge) in their project plan in Play Part 1.

Showcase Standards

Computer Science Teacher Association (CSTA)

CSTA 1A-AP-10: Develop programs with sequences and simple loops, to express ideas or address a problem.

How Standard is Achieved: Students will need to sequence behaviors together correctly in both their project plan in Play Part 1, but also the VEXcode GO project they create in Play Part 2.

Showcase Standards

Computer Science Teacher Association (CSTA)

CSTA 1B-AP-11: Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.

How Standard is Achieved: Students will be given a challenge in Play Part 1 that they will then need to decompose into behaviors with their project plan in Play Part 1.

Summary

Materials Needed

The following is a list of all the materials that are needed to complete the VEX GO Lab. These materials include student facing materials as well as teacher facilitation materials. It is recommended that you assign two students to each VEX GO Kit.

In some Labs, links to teaching resources in a slideshow format have been included. These slides can help provide context and inspiration for your students. Teachers will be guided in how to implement the slides with suggestions throughout the lab. All slides are editable, and can be projected for students or used as a teacher resource. To edit the Google Slides, make a copy into your personal Drive and edit as needed.

Other editable documents have been included to assist in implementing the Labs in a small group format. Print the worksheets as is or copy and edit those documents to suit the needs of your classroom. Example Data Collection sheet setups have been included for certain experiments as well as the original blank copy. While they offer suggestions for setup, these documents are all editable to best suit your classroom and the needs of your students.

Materials	Purpose	Recommendation
VEX GO Kit	For students to build the Code Base 2.0 and possible additions for their project.	1 per group
Code Base 2.0 Build Instructions (3D) or Code Base 2.0 Build Instructions (PDF)	For students to build the Code Base 2.0 if they have not already.	1 per group
Pre-built Code Base 2.0	From previous Labs. For students to test projects.	1 per group
VEXcode GO	For students to create and start projects on the Code Base.	1 per group
Robotics Roles & Routines Google Doc / .docx / .pdf	Editable Google Doc for organizing group work and best practices for using the VEX GO Kit. For students to build the Code Base if they have not already.	1 per group
Blueprint Worksheet Google Doc / .docx / .pdf	Editable Google Doc for students to storyboard and plan their project.	1 per group
Tablet or Computer	For the students to use VEXcode GO.	1 per group
Lab 4 Image Slideshow Google Doc / .pptx / .pdf	For teachers and students to reference throughout the Lab.	1 for teacher facilitation
Pencil	For students to write and sketch ideas for their project plan.	1 per group
Measuring Tool	For students to measure distances in their project plan for Play sections.	1 per group
Pin Tool	To help remove pins or pry beams apart.	1 per group
Get Ready...Get VEX...GO! PDF Book (optional)	To read with students to introduce them to VEX GO through a story and introductory build.	1 for demonstration purposes
Get Ready...Get VEX...GO! Teacher's Guide	For additional prompts when introducing students to VEX GO	1 for teacher use

Materials	Purpose	Recommendation
Google Doc / .pptx / .pdf	with the PDF Book.	

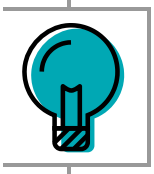
Engage

Begin the lab by engaging with the students.

Hook

Who remembers the three types of jobs that robots complete?
Connect this Lab to Lab 1, where students learned that robots do jobs that are dirty, dull, or dangerous. Show examples of different job scenarios.

Note: If students are new to VEX GO, use the Get Ready...Get VEX...GO! PDF book and Teacher's Guide (Google Doc/.pptx/.pdf) to introduce them to learning and building with VEX GO. Add an additional 10-15 minutes to your lesson time to accommodate this additional activity.



Leading Question

Now, we are going to choose a dirty, dull, or dangerous job scenario for our Code Base robot and plan our projects.

Build

Code Base 2.0

Play

Allow students to explore the concepts introduced.

Part 1

Students will choose a scenario and create a project plan using the Blueprint Worksheet. Students can include plans to build an addition to the Code Base robot using VEX GO pieces.

Mid-Play Break

Students will share their project plans in a class discussion.

Part 2

Students will create and start their projects. Students should identify what task their robots were asked to complete.

Share

Allow students to discuss and display their learning.

Discussion Prompts

- If a Code Base needed to complete this task multiple times, what could you add to the project?
- What if you didn't know the exact distance that the Code Base needed to move forward? What could you add?
- What if the Code Base was facing the wrong direction to begin the project? What could you add?

Engage

Launch the Engage Section

ACTS is what the teacher will do and ASKS is how the teacher will facilitate.

ACTS	ASKS
1. Connect this STEM Lab to Lab 1 where students learned the jobs that robots complete: dirty, dull, or dangerous jobs. 2. Show slides 2 - 7 in the Lab 4 Image Slideshow as example scenarios. 3. Continue to show the slides to the students. 4. Introduce the goal for the Lab.	1. Who remembers the three types of jobs that robots complete? 2. Show some examples of scenarios where robots do dirty, dull, or dangerous jobs. 3. How can we code our Code Base to complete a task that is dirty, dull, or dangerous? 4. We are going to choose a dirty, dull, or dangerous job scenario for our Code Base robot and plan our projects.

Getting the Students Ready to Build

Now we are going to choose a dirty, dull, or dangerous job for our Code Base robot and plan our projects.

Facilitate the Build

1

Instruct

Instruct students to join their team, and have them complete the Robotics Roles & Routines sheet. Use the Suggested Role Responsibilities slide in the Lab Image Slideshow as a guide for students to complete this sheet.

They should complete the “Start Up” routine (check Code Base 2.0 build, make sure the Brain and the device are charged, and launch VEXcode GO). Then, they will choose the job scenario for their Code Base robot. They should also think about any additions that they want to make to the Code Base robot to help it complete its task.

2

Distribute

Distribute a pre-built Code Base 2.0 or build instructions to each group. Journalists should gather the materials on the checklist if needed.

Code Base 2.0

3

Facilitate

Facilitate the “Start Up” routine and groups choosing their scenario.

1. Is the Battery charged?
2. Is the Code Base built properly, not missing any pieces?
3. Are all wires connected to the correct ports on the Brain?
4. Is the device charged?
5. Launch VEXcode GO on a device.
6. Connect the Brain to VEXcode GO.

Note: When you first connect your Code Base to your device, the Gyro built into the Brain may calibrate, causing the Code Base to move on its own for a moment. **This is an expected behavior, do not touch the Code Base while it's calibrating.**

1. What scenario will you choose for your Code Base's job?
2. Can you think of any additions that you can make to the Code Base build to help the robot complete its tasks?

4

Offer

Offer support to groups that need assistance in launching VEXcode GO. Share ideas for building on to the Code Base using VEX GO Kit pieces.

Teacher Troubleshooting

Ensure devices and Batteries are charged before beginning the Lab.

Facilitation Strategies

- If students are having a hard time choosing a job scenario, roll a six-sided die to choose for the group! Label each job scenario as a number (1-6) before rolling the die.
- Encourage groups to think about additions to the Code Base like an arm for scooping trash or a camera to take pictures of wild animals. Students may spend too much time creating their additions. Circle the

classroom and check on groups to make sure they still are working on their project plan.

- If there is time, ask students to build the setting for their scenario using classroom materials. For example, are they investigating a sea creature? Allow students to build the sea creature to use in their project.
- Use the Get Ready...Get VEX...GO! PDF Book and Teacher's Guide - If students are new to VEX GO, read the PDF book and use the prompts in the Teacher's Guide (Google Doc/.pptx/.pdf) to facilitate an introduction to building and using VEX GO before beginning the Lab activities. Students can join their groups and gather their VEX GO Kits, and follow along with the building activity within the book as you read.
    - Use the Teacher's Guide to facilitate student engagement. To focus on VEX GO connections in a more concrete or tangible way, use the Share, Show, or Find prompts on each page to give students an opportunity to get to know their kits in more depth.
    - To focus on the habits of mind that support building and learning with VEX GO, like persistence, patience, and teamwork, use the Think prompts on each page to engage students in conversations about mindset and strategies to support successful group work and creative thinking.
    - To learn more about using the PDF book and accompanying Teacher's Guide as a teaching tool any time you are using VEX GO in your classroom, see this VEX Library article.

Play

Part 1 - Step by Step

1

Instruct

Instruct students to choose a dirty, dull, or dangerous job scenario for the Code Base robot, and create a plan for their project. Students can use one of the scenarios provided (see slides 2-7 in Lab 4 Image slideshow), or they can create their own dirty, dull, or dangerous job scenario. The goal of the project is to instruct the Code Base robot to complete a job task using commands that they have learned in the unit: [Drive for] and [Turn for].

Students should create a project plan using the Blueprint Worksheet. They can also sketch ideas for additions that they want to build onto the Code Base robot to help it complete its task in the job scenario.

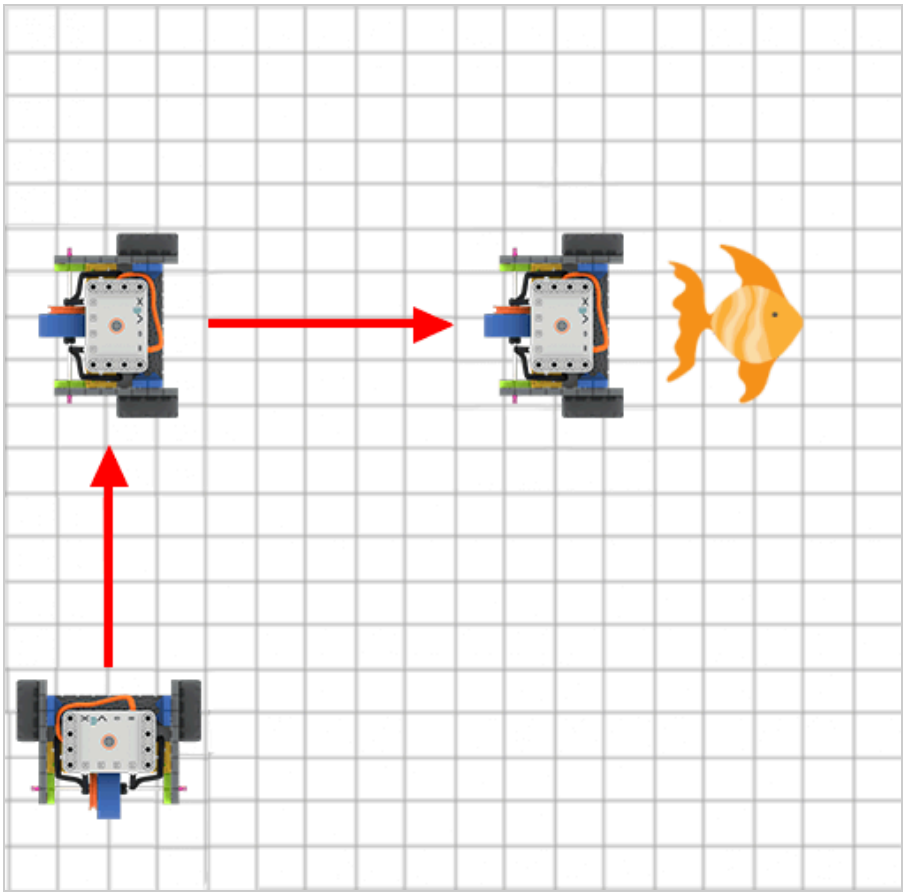
Project Plan

2

Model

Model the steps to create a plan using a Blueprint Worksheet.

1. Tell students that they want their Code Base robot to complete a dangerous underwater exploration job.
2. Show students how to use the Blueprint Worksheet by sketching each step to map the path their robot will take to complete the task.
    a. Example plan: I want my robot to move closer to a sea creature that hasn't been discovered yet!
        i. Sketch the Code Base robot moving forward
        ii. Sketch the Code Base robot turning right
        iii. Sketch the Code Base robot moving forward towards the sea creature



Blueprint Sketch

3

Facilitate

Facilitate a discussion as students create a plan for their project and an artifact:

1. What kind of job do you want your robot to do? Dirty, dull, or dangerous?
2. What instructions does the robot need to complete the job?
3. What artifact can you create to support your scenario?

4

Remind

Remind groups that they can have multiple iterations of their plan before creating their project. Embrace failure, it's a part of the learning process.

5

Ask

Ask students to think about a job or a chore they have had to do at home. Did someone explain how to do the job? Did it take multiple attempts to learn how to do the job correctly? Could they explain the steps to complete that job to a friend?

Mid-Play Break & Group Discussion

As soon as every group has finished their project plan, come together for a brief conversation.

Have groups share project plans and ask the following questions:

- What job are you going to have your robot do?
- How will the Code Base robot move to complete the task?
- What steps did you create on your Blueprint Worksheet?
- Is there anything you're still unsure about?

Part 2 - Step by Step

1

Instruct

Instruct each group to create and start their projects. The goal of this activity is to use their project plan and VEXcode GO to instruct their Code Base robot to complete a task in their chosen dirty, dull, or dangerous job scenario.

2

Model

Model using a group's setup how students will use the {When started}, [Drive for], and [Turn for] blocks to instruct their Code Base robot to move.

Before beginning, ensure the students have configured the Code Base in VEXcode GO. The [Turn for] and [Drive for] blocks will not be available until the Code Base is configured.

1. Show students how to measure the distance that the Code Base robot needs to move, then select the direction the Coe Base robot should move and enter the distance value in the [Drive for] block.

[Drive for] block

2. Demonstrate how to set the turn direction and distance by selecting 'right' or 'left' and entering a number of degrees in the [Turn for] block.

[Turn for] block

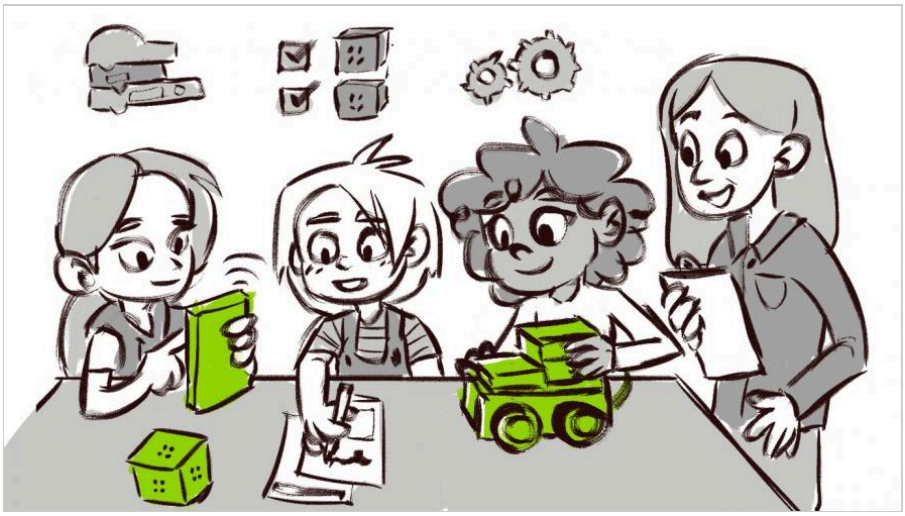
3

Facilitate

Facilitate a discussion with groups as you circle the classroom. Check to make sure the students understand that the goal of this activity is to use their project plan and VEXcode GO to instruct their Code Base robot to complete a task in their chosen dirty, dull, or dangerous job scenario.

Ask groups to describe how they are using their project plan to help them sequence instructions for the Code Base robot. Example questions include:

1. Show me how instructions for the Code Base robot are written or drawn in your project plan.
2. What actions does your Code Base robot need to do in this task?
3. How far does it need to move forward/backward?
4. How far does it need to turn? How many degrees is that?



Group Discussions

4

Remind

Remind students to reflect on what they have learned in past lessons about how to instruct their Code Base robot to move a specific distance, and how to include the degrees of turns.

5

Ask

Ask students to come up with at least two additional scenarios or jobs where they could use their Code Base robot project to complete a task. How could they add on to their project to have the Code Base robot complete additional tasks in their scenario?

Optional: Groups may deconstruct their Code Base robot if needed at this point in the experience.

Share

Show Your Learning

Discussion Prompts

Observing

- What blocks did you use in your project? Can you explain what they do?
- How do you change how far the Code Base robot moves?

- What dirty, dull, or dangerous job did your Code Base robot perform? Why was it useful for a robot to perform this task, rather than a person?

Predicting

- If a Code Base robot needed to complete this task multiple times, what could you add to the project?
- What if you didn't know the exact distance that the Code Base robot needed to move forward? What blocks could you add?
- What if the Code Base robot was facing the wrong direction to begin the project? What blocks could you add?

Collaborating

- How did your group work together to create your project plan?
- How did you communicate what you wanted the Code Base robot to do with your group members?