# CTE Workcell Teacher Facilitation Guide

## Unit 6 - Absolute and Relative Movements

**A Note about Implementing VEX CTE STEM Lab Units:**
*STEM Lab Units are designed to be an interactive Unit of instruction that you can use with your students to implement the VEX CTE Workcell in your setting. STEM Lab Units are student-facing content that is designed for students to directly interact with the videos, resources, and instructional materials to complete the activities. This Facilitation Guide is the teacher-facing companion, like a teacher's manual, providing the resources, materials, and information needed to be able to plan, teach, and assess with the VEX CTE Workcell. For more detailed information about implementing STEM Lab Units in your classroom, visit VEX PD+ for videos, expert tips, and more.*

**Unit Overview**

In this Unit, students will learn about the difference between absolute and relative movement, and code the 6-Axis Arm to move using both types of motion. Students will learn about why a combination of absolute and relative movement is important in an industrial context, and will apply that concept by coding the 6-Axis Arm to draw squares and patterns. Throughout the Unit students will learn about computer science concepts like variables and Repeat loops, so they can code the 6-Axis Arm more efficiently. Students will also learn a process for reading code and documenting it in their engineering notebook. By the end of the Unit students will apply their learning to code the 6-Axis Arm to draw a specific pattern.

**Unit Essential Questions -** *These open-ended, thought-provoking questions are designed to guide inquiry and encourage deeper understanding. They can provide context and relevance for students, and help them to see the bigger picture or the real-world applications of what they're learning.*

- What is the difference between absolute and relative movements in robotic coding?
- How can relative movement commands enhance the efficiency and flexibility of robotic tasks?
- Why is it important to understand both absolute and relative movements when coding a robot?

**Unit Enduring Understandings -** *These understandings reflect the big ideas you want students to understand and be able to use several years from now, as well as identify predictable misunderstandings.*

- Students will understand that absolute movements direct the robot to specific, fixed points, while relative movements are based on a robot's current position, offering more dynamic and adaptable programming options.
- Students will understand that using relative movements can simplify programming, especially when repeating tasks or patterns, and allow for easier adjustments and adaptations.
- Students will understand that a deep knowledge of movement commands is essential for effective robotic programming and can be applied to a wide range of complex tasks and challenges in robotics.

**Lesson Overview**

- The **Introduction** page introduces absolute and relative movement, the difference between them, and their industrial applications. The page also covers key vocabulary and required materials. Additionally, guidance for students on how to co-create learning targets for the Unit is provided.
- The **Power and Connect the 6-Axis Arm** Lesson reminds students how to connect the cables of the 6-Axis Arm to a power source and a computer. It also reviews how to connect the 6-Axis Arm to both web-based and app-based VEXcode EXP. Students can skip this page if they do not need these reminders.

- In **Lesson 1: Relative Movement** students learn about the difference between absolute and relative movement, and how to code the 6-Axis Arm to move using both types of motion. Students learn about the difference between the **Move to position** block and the **Increment position** block, as well as how to apply their knowledge of the coordinate system of the 6-Axis Arm to use the **Increment position** block effectively.
- **Lesson 2: Reading Code** teaches students a process for code reading, and walks them through how to read code, visualize what the 6-Axis Arm will do, and document those behaviors in their engineering notebook. Students then practice this process to read code to identify an error in a project.
- In the **Mid-Unit Reflection and Goal Adjustment** students will check-in about their learning and progress towards the learning targets you co-created at the start of the Unit. They will complete a Mid-Unit Reflection, discuss their progress with you, and adjust learning targets as needed for the remainder of the Unit.
- In **Lesson 3: Variables** students learn about what a variable is and how to create and use a variable in VEXcode. They then apply this learning to use variables for the value of the side length of a square, to make their projects more efficient.
- **Lesson 4: Repeating Behaviors** expands on what students learned in Lesson 3 and introduces the **Repeat** block to repeat behaviors. Students also learn about how to change a variable value each time a project iterates through the loop, to code the 6-Axis Arm to draw squares from the same starting location that change in size.
- The **Putting It All Together** activity challenges students to apply their learning to create a project to draw a repeating pattern with the 6-Axis Arm.

## Materials Needed for this Unit (per group)

- CTE Workcell Kit
- VEXcode EXP
  - Students can download the app-version of the software to their Windows or Mac device at code.vex.com.
  - Students can also use the web-based version on a Google Chrome or Microsoft Edge browser at codeexp.vex.com.
- A Computer
- Engineering Notebook (per student)

All Materials needed for this Unit can also be found in the Master Materials List.

## Teacher as Facilitator in this Unit

This Unit is designed to be student-facing so that students can directly interact with the Unit content. This places the teacher in the role of facilitator of learning, rather than a supplier of information, in the classroom. As such, you can choose how you want the students to move through the Unit content, based on the needs and interests of your students, and the places where you think they may need more or less direct instruction. You know your students best, so tailor your teaching and implementation to best suit your students.

## Troubleshooting Tips for this Unit

- **'Unreachable' positions -** If students are getting errors that a position is 'unreachable' with the Pen Holder Tool, have them adjust their coordinates by 5-10mm. Due to the way that the 6-Axis Arm moves in order to draw effectively, the range of motion of the 6-Axis Arm is different than it was with the Magnet.

- Students will need to have access to VEXcode EXP on their computers. For more information about accessing VEXcode EXP, go to code.vex.com.

**Group Size**

- A group size of 2-4 students per VEX CTE Workcell Kit is recommended for all activities. This recommendation can vary depending on the needs of your classroom.
- Read this article to learn more about supporting student collaboration throughout the Unit.

## Unit Vocabulary

The suggested vocabulary for this Unit is meant to offer teachers a vehicle for establishing a shared language in the classroom when working with VEX CTE. Encourage students to work vocabulary words into their conversations throughout the Unit, so that they can use the terms confidently and correctly not only in this Unit but also in future VEX CTE experiences. You can use these words as a base list, and adapt them to best meet the needs of your students.

- **Absolute Movement** - Moving a robotic arm to a specific location based on set coordinate values. These coordinates are 'absolute', meaning they are fixed points in the robot's operating space.
- **Relative Movement -** Moving a robotic arm to a new position based on its current location, rather than fixed coordinates. This means the movement is calculated 'relative' to where the robot is currently positioned.
- **Variable** - A way of storing a value to be used later in a project.
- **Repeat Loop** - A block that repeats the blocks within it a set number of times.

## Preparing Your Classroom

- All students must have access to VEXcode EXP on their device before beginning the Unit.
    - The app-version of the software can be downloaded to Windows or Mac devices at code.vex.com.
    - The web-based version is available on Google Chrome or Microsoft Edge browsers at codeexp.vex.com.
- In order to code with VEXcode EXP, the 6-Axis Arm and computer must have a wired connection.
    - Make sure that each group is in a space where the 6-Axis Arm can be plugged into a power source and have a wired USB-connection to a computer with VEXcode EXP access.
    - To further support students as they are getting started and connecting their 6-Axis Arm to VEXcode EXP, you can use the following resources.
        - For help connecting the 6-Axis Arm to web-based VEXcode EXP, select the article that matches your device:
            - Windows

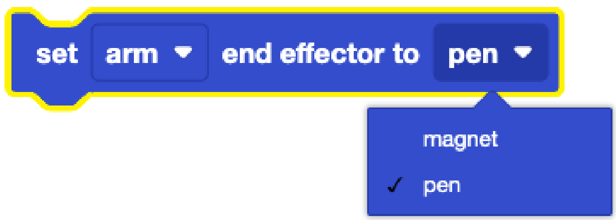
      - Mac
      - Chromebook
    - For help connecting the 6-Axis Arm to app-based VEXcode EXP, see this article.

- Each 6-Axis Arm should have had its firmware updated prior to starting the Unit. However, if a message in VEXcode EXP appears when the 6-Axis Arm is connected to update the firmware, follow the steps here:
  - App-based VEXcode EXP
  - Web-based VEXcode EXP

## Teacher Tips

### Throughout this Unit:

**Be sure that students use the marker that comes in the CTE Kit with the Pen Holder Tool.** The **Set end effector** block in VEXcode EXP uses the marker from the Kit as the default offset.




- If the Pen is drawing very faint lines, remind students to check that the marker is correctly inserted in the Pen Holder Tool. The repetitive act of drawing can sometimes cause the marker itself to shift in the attachment. Be sure the marker is fully seated in the attachment and try the project again.
- **A Note About 'Unreachable' Positions -** Students may notice that the 6-Axis Arm moves differently with the Pen Holder Tool than it did with the Magnet. This is intentional, as it enables the 6-Axis Arm to draw straight lines effectively. As such, the range of motion of the 6-Axis Arm with the Pen is different than it was with the Magnet.
  - If students are getting errors that a position is 'unreachable' with the Pen Holder Tool, have them adjust their coordinates by 5-10mm. This should be enough to enable them to draw the desired line.
  - Students can also use the Teach Pendant to further explore the limits of the motion with the Pen Holder Attachment.

**Note:** If you have not already done so, read this article to learn more about supporting student collaboration throughout the Unit.

### Lesson 1: Moving Along Multiple Axes

- Students will use the **Move to position** block when coding the arm using absolute movement, and the **Increment position** block when coding the arm using relative movement in this Lesson. Remind students to carefully consider the kind of motion needed in their projects as they choose the block they are adding.



- When building the project to draw the square with relative movements, there are two places in the direct instruction where there is an intentional error made. The 6-Axis Arm may move off the CTE Tile when this happens - that is expected. The goal is to help students identify that drawing the final two sides of the block (side CD and side DA) requires moving the 6-Axis Arm in the *negative* direction on the x and y-axes.
- If students are struggling with differentiating between absolute and relative movement, engage them in a brain break exercise to practice moving in both ways.
  - First, have students all walk from their desks to a specific location in the classroom (like the door, or the pencil sharpener, etc.). Ask students if they used absolute or relative movement to get there, and why they think that.
    - This is absolute movement - even with different starting locations, all students went to the same location.
  - Then, have students go back to their desks. Now tell them to walk 5 steps to the right and 3 steps forward. Ask students if they used absolute or relative movement to get there, and why they think that.
    - This is relative movement - every student will walk to a different location based on where they started.
  - Next call out different locations or relative movements, and have students move and identify the type of motion. Repeat this process as many times as needed, or as a quick brain break throughout the Unit to help students solidify their understanding.

### Lesson 2: Reading Code

- Code reading is an essential skill in computer science, and one that will take a lot of practice for students to really excel at. Students have been exposed to code reading every time they looked at a project and made a prediction about how the 6-Axis Arm would move in their engineering notebook. The goal of this lesson is to give students a process to follow to make code reading a more methodical and meaningful activity.
- The Activity for this Lesson explicitly tells students to check in with you once they have read the code and made a prediction about the 6-Axis Arm's behavior. It is recommended to review the behavior of the 6-Axis Arm as a whole class, to ensure that students can have a more authentic code reading experience (without seeing the movement of the 6-Axis Arm before they have completed the process). Build the project and run it on one group's CTE Workcell, and have the class gather around to view it. Then discuss their predictions and have groups share their documentation with one another.
- Students should document the code reading exercises in the Lesson in their engineering notebooks. For reminders about how engineering notebooks can be used as a learning tool in the classroom, [read this article.]

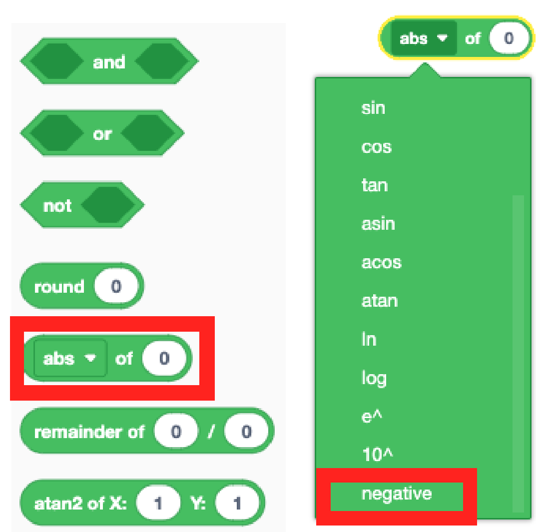
## Mid-Unit Reflection and Goal Adjustment

This Unit contains a Mid-Unit Reflection and Goal Adjustment, to enable you and your students to check-in about their learning and progress towards the learning targets you co-created at the start of the Unit. This is an opportunity for students to self-assess their progress and discuss the reasoning for that assessment with you, so you can address misconceptions or misunderstandings in the class, and together, adjust students' learning targets to ensure they can effectively progress toward them for the remainder of the Unit.

1. **Be sure students understand how to engage in the reflection process.** Similar to the Wrap-Up Reflection and Debrief Conversation, students will self-assess their progress towards their learning targets, give evidence to support that assessment, and then discuss their assessment with you in a student-teacher conference. Discuss the content in the direct instruction as a whole class, to be sure that students understand what is expected of them when they begin the self-assessment.
2. **Students complete the Mid-Unit Reflection organizer**. In this organizer (Google Doc / .docx. / .pdf), students will give themselves a rating for each of the learning targets, cite evidence for that rating, and can make notes about any questions they have about their learning. The goal of the organizer is to give students a framework for reflection, so they can think about what they are learning, how they are learning, and what they can do with their learning more deeply.
3. **Discuss the Mid-Unit Reflection with students.** Once students have completed the self-assessment, they should share it with you, so that you can (in a brief conversation) see how they perceive their progress towards their learning targets. In these conversations you should:
    a. Look at the rating for each learning target. Do you agree? If not, why not?
    b. Look at the evidence students note for their rating. Does it reflect the full picture of what they are doing and learning in class?
    c. Talk about whether or not the student feels the target is achievable by the end of the Unit. If not, why not? What questions do they need to answer? Does the learning target need to be adjusted with that student?
    d. Mark any learning targets that should be adjusted with the student, and be sure they understand how to edit them effectively (e.g. do they need to be broader or more specific).
4. **Debrief with a whole class discussion.** After meeting with all students, have a whole class discussion about their learning and progress. Address any common misconceptions or misunderstandings, have students share successful strategies, and give them an opportunity to ask questions that will help them reach their goals.
5. **Have students adjust their goals as needed.** Based on the reflection and conversations, students should then adjust their learning targets as you discussed in your conference. Check in with students to be sure you have a shared understanding of their new learning targets.

## Lesson 3: Variables

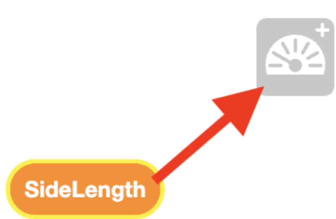
- Be sure that students are using the correct block in the Operators section of the Toolbox to change the value of the variable to a negative. This is called the **Function** block. They may need to scroll through the parameter options in the **Function** block to select 'negative'.

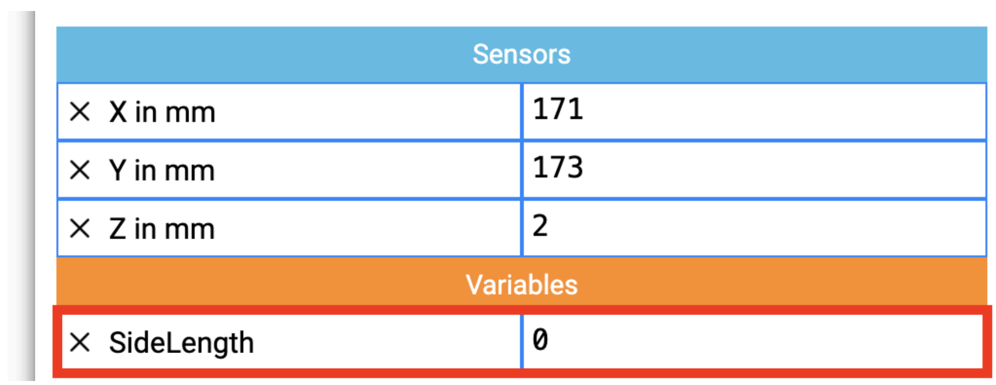


- As you circulate around the room while students are working through the Lesson, encourage them to practice their code reading skills by asking questions like:
    - What does this block do in your project?
    - Can you explain how the variable is used in that **Increment position** block? How far will that move the 6-Axis Arm? How do you know?
    - How would you explain this project to someone who was new to coding the 6-Axis Arm?

## Lesson 4: Repeating Behaviors

- To help students understand the project flow of a Repeat loop and how the **Repeat** block is functioning in their project, ask them questions as they are working to have them explain the loop within the project.
    - Which blocks are being repeated in your project? How do you know?
    - What would happen if you change the parameter in the Repeat loop? What if you made it lower or higher? How would that affect the behavior of the 6-Axis Arm?
- To help students think about how the variable is changing through the iterations of the Repeat loop ask them questions about the value of the variable at each iteration, like:
    - What is the side length for the second iteration of the loop?
    - What is the side length of the final iteration of the loop?
    - If you made the Repeat 6, what would the value of the side length be on the 6th iteration? How do you know?
- **You can also use the Step feature to step through the project.** This gives you the opportunity to execute the project one block at a time. You can have students predict the value of the variable at the end of the Repeat loop – then watch at the exact moment in the project that the variable changes. This can be a helpful way to show students how the variable changes with each iteration throughout the loop.
- **Pro Tip: Students can use the Monitor to show the value of their variable.** To do this, drag and drop the **sideLength** variable block from the Toolbox into the Monitor. The variable will then appear in the Monitor. As the project runs, the variable value will be updated in real time.



| Sensors | |
|---|---|
| X in mm | 171 |
| Y in mm | 173 |
| Z in mm | 2 |
| **Variables** | |
| SideLength | 0 |

- You can also have students experiment with changing the number of iterations of the Repeat loop, the amount the variable is changing, and the initial side length to help them see more examples of how the variable is changing in the project.
- Remind students that they can use the **STEP** button to step through the project one block at a time, to help them better understand how the **Repeat** block functions within the project.

## Putting It All Together:

- **Students may need to decrease the value of the variable in order to draw the spiral pattern (rather than increase it as they did in Lesson 4).**

    - The **Change variable** block accepts negative parameters. Students can use a negative parameter to change the size of the sideLength and make it smaller.


    - This works because for each iteration of the **Repeat** block, the variable is changed by a negative value, essentially subtracting that number from the value instead of adding it.
    - If drawing the spiral in this way, the starting value of the sideLength variable should be larger. As students are planning their projects, remind them to think about the value of the variable with each iteration of the **Repeat** block in their project.
- There are multiple ways to code the 6-Axis Arm to draw the pattern, the animation on the Putting It All Together Page shows one possibility. Remind students to plan their project with their group and document their plan in their engineering notebook **before** they dive into coding it.
    - Guide groups to make decisions collaboratively by reminding them of things like:
        - Give every member of a group a chance to offer an idea for how to solve the challenge before the group decides on one.
        - If all students in a group are not in agreement right away, try both approaches. Take a vote on which approach to try first, then try the other idea. Evaluate each for efficiency and success at meeting the goal of the challenge.
        - Everyone in the group should be able to explain the group's plan. Give students an opportunity to visit other groups and ask about their projects, so they have practice explaining it.
- As students are coding the 6-Axis arm to draw the pattern, remind them to create and test their project in small increments. Frequent testing of the project will help students determine whether the project is working as intended before moving on. For instance, be sure that each part of the pattern is drawn as intended before moving on to the next.

## Engineering Notebooks

Incorporating engineering notebooks into your classroom offers a dynamic and collaborative way for students to document their learning journey in engineering and robotics. As a facilitator, encourage students to regularly use their notebooks to record self-assessments and note coordinates during activities. This tool not only aids in project management and problem-solving but also prepares students with essential life skills in documentation and collaboration, pivotal in both academic and future professional settings.

### Using Engineering Notebooks

- Continue in the **same** Engineering Notebook students have been using since Unit 1, whether it is a physical notebook or the CTE Digital Engineering Notebook.
    - This gives students a comprehensive view of their learning over the course, and makes it easier to reflect, rethink, and revisit their learning throughout the course.
- If you have not done so already, view the video in the Teacher Portal and read this article to learn more about using engineering notebooks as a learning tool in your classroom.
- Use the following links only if you need to create a **new** CTE Digital Engineering Notebook for a student.
    - CTE Digital Notebook template (Google Slides) (Microsoft PowerPoint)

- Digital CTE Parts (Google Slides) (Microsoft PowerPoint)
- CTE Digital Notebook instructions (Google Slides) (Microsoft PowerPoint)
  - If using the Google Slides version, you will be required to make a copy when opened.


- For more information on customizing resources view these two articles from the STEM Library:
  - Customizing Resources Using Google Drive
  - Customizing Resources Using Microsoft Office

- **Documenting in this Unit:** Students should use their engineering notebook to record their code reading, draw their Whiteboard predictions, plan their projects, answer Check Your Understanding questions, and complete the Mid-Unit Reflection and Wrap-Up Reflection.
  - Encourage students to keep track of their thinking as well as their projects in the engineering notebook. This will make it easier for them to engage in the reflective learning cycle needed to participate fully in the Mid-Unit and Wrap-Up Reflections and Debrief Conversation at the end of the Unit.

- **Using Engineering Notebooks in Student Self-assessment:** Engineering notebooks are an important tool for student self assessment. They provide a record of students' learning over time, making their progress visible to both you and the students. In this Unit, students will use their Engineering Notebooks as they self-assess by:
  - Recording their Learning Targets
  - Recording answers to Check Your Understanding Questions
  - Recording their Mid-Unit Reflection
  - Recording their reflective rating in the Wrap Up Reflection
  - Using them to support their answers as they discuss their progress with you in the Debrief Conversation

Read the following section for more information on how engineering notebooks are an important part of assessment and reflection.

## Assessment and Reflection

### Check Your Understanding Questions (CYU)

At the end of each Lesson, a set of CYU questions are provided as formative assessment to check student understanding before moving on with the rest of the Unit.

- The Answer Key for the questions can be found here. (Google doc / .docx / .pdf)

Two types of Check Your Understanding Questions are provided for students to answer in their engineering notebooks throughout the Unit. For a reminder about incorporating CYU questions into your teaching practice, read this article.

- **Content-Related Questions**: Students can use these questions to determine how well they understand the essential concepts of each Lesson, and you can use their answers to be sure students have grasped the material fully before moving on. As the Lessons in this Unit are sequential, be sure to reteach any concepts or knowledge gaps prior to having students continue to progress through the Lessons.
- **Student Engagement Questions:** These questions prompt students to reflect on whether or not they are reaching their learning targets and how they are feeling about their learning throughout the Unit. They help students to remain active participants in their learning process. They should be used as discussion prompts as you are facilitating the Unit and during the Debrief Conversation,  as students' answers to these questions can help you make decisions about how to best support them moving forward.

For more information on formative assessment, view these videos from the VEX Video Library:

- Connecting Research and Teaching: The Purpose of Formative Assessment
- Connecting Research and Teaching: Formative Assessment Strategies
- Connecting Research to Practice: Eliciting Student Understanding
    - To view additional CTE videos as well as a wealth of professional development resources, join PD+! Find out more and become a PD+ subscriber here.

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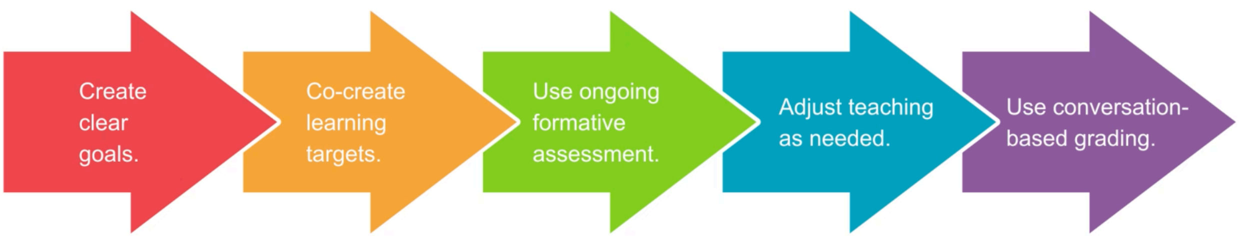
### Student Self-Assessment




Student self-assessment has been shown to intrinsically motivate students and keep them engaged. It is woven throughout the Unit, following the process depicted in the graphic above.

- In the Introduction Lesson, you will establish a shared goal with students, and co-create learning targets.
- Ongoing formative assessment occurs throughout each lesson in the form of Check Your Understanding Questions that allow you to check students' conceptual understanding and progress towards their learning targets, allowing you to adjust your teaching to meet student needs as needed throughout each Lesson.
- Additional formative assessment is provided in longer Units, such as this one, in the form of a Mid-Unit Reflection and Goal Adjustment, giving students the opportunity to check on their progress in reaching their learning targets.
- In the "Putting it all Together" section, formative assessment continues with the Wrap Up Reflection, which encourages students to consider their engagement and learning across the whole Unit.
- The Debrief Conversation provides an opportunity for conversation-based grading as you discuss the Wrap Up Reflection with student groups along with the rubric provided.

- Students' engineering notebooks are used throughout the Unit to document their learning process, and are a rich source of information about students' evolving thinking and learning.

Read more about student self-assessment components in the Unit below.

## Co-creating Learning Targets

Co-creating learning targets helps students to feel a sense of ownership and responsibility towards their learning, leading to a more engaged and motivated classroom environment. You will co-create learning targets with students in their groups in the Introduction Lesson of the Unit. You will then use them to guide students to monitor and reflect on their progress and learning throughout the Unit, and to reflect on them during the Debrief Conversation as well.

Follow these steps with your students when co-creating learning targets:

- **Step 1: Establish a shared goal.** A video in the Introduction Lesson provides information about what students will be learning and doing in this Unit. Use this video as a basis for establishing a shared goal with students. This is a crucial first step - without a shared goal it will be difficult for students to create learning targets that are guiding them towards the essential understandings of the Unit.

- **Step 2**: **Help students to determine the essential knowledge they need in order to be successful in reaching that shared goal.** What things will students need to learn and do in order to successfully complete the Putting It All Together Activity at the end of the Unit? Guide students to brainstorm a list and record them in their Engineering Notebooks. Because students will be attaching the Pen Holder Tool to the 6-Axis Arm, identifying waypoints to move around obstacles, and coding the 6-Axis Arm to move around obstacles and through a maze, their lists will likely include things like:
    - Identify what a relative movement is.
    - Identify the difference between the **Move to position** and **Increment position** blocks in VEXcode.
    - Use an **Increment position** block in a project with the 6-Axis Arm.
    - Use a variable in a project to store a value.
    - Use a **Repeat** block in a project to repeat behaviors.
    - Work collaboratively to complete the activity with the 6-Axis Arm.

- **Step 3**: **Co-create learning targets based on the brainstormed list.** Guide students to take each of the list items and frame them into a learning target. Students can phrase them in the form of "I can" statements, such as "I can identify the difference between absolute and relative movement". This template (Google Doc / .docx / .pdf) has been provided to students to help them write their learning targets in their Engineering Notebooks.

It is important to encourage students to create learning targets that address all of the following domains, to ensure that they are creating targets that address deeper learning as well as surface level knowledge:

- **Knowledge** - What do I need to know in order to successfully complete the Putting it All Together Activity?
    - Example: "I can identify the difference between absolute and relative movement."
- **Reasoning** - What can I do with what I know and understand about a concept in order to successfully complete the Putting it All Together Activity?
    - Example: "I can use a variable in a project with a Repeat loop to code the 6-Axis Arm to draw a square."

- **Skills** - What can I demonstrate to show that I understand the concept and will be able to use it to successfully complete the Putting it All Together Activity?
  - Example: "I can use the **Increment position** block to code the 6-Axis Arm to move in relative movements."
- **Products** - What can I make to demonstrate my learning of the concept?
  - Example: "I can document the absolute and relative movements needed to draw a square in my engineering notebook."

### The Wrap Up Reflection

A Wrap Up Reflection is included at the end of the "Putting It All Together" page in the STEM Lab Unit. This reflection prompts students to reflect on their learning and self-assess their understanding. During the Wrap Up Reflection, students will rate themselves as novice, apprentice, or expert on each of the essential concepts covered in the Unit in their Engineering Notebooks. Then they will reflect on the progress they made towards the learning targets they co-created with you at the beginning of the Unit.

### The Debrief Conversation

The Debrief Conversation at the end of the "Putting It All Together" page is an opportunity for students and teachers to sit down together to discuss the student's progress towards the co-created learning targets over the course of the Unit, using the Debrief Conversation Rubric (Google doc / .docx / .pdf) provided as a tool. Students should support their assertions in the Debrief Conversation with documentation from their engineering notebooks. Read this article to learn more about having effective Debrief Conversations with students.