VEX V5 Teacher Facilitation Guide
Team Freeze Tag Unit

A Note about Implementing V5 Learn Practice Compete STEM Labs:
Learn Practice Compete STEM Labs are designed to be an interactive Unit of instruction that you can use with your students to implement V5 in your setting. STEM Labs are student-facing content that is designed for students to directly interact with the videos, resources, and instructional materials to complete the Lesson 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 comfortably. For more detailed information about implementing STEM Labs in your classroom, visit VEX PD+ for videos, expert tips, and more.

Unit Overview

In the Team Freeze Tag Unit, students will build the TrainingBot and learn to drive it with the Controller, in order to play a game of Team Freeze Tag in the Unit Competition.

- In **Lesson 1: Introduction** students will build the TrainingBot and be introduced to the challenge of Team Freeze Tag.
- In **Lesson 2: Driving with the Controller**, students will test different driver configurations on the Controller, as they learn to drive the TrainingBot via remote control.
- In **Lesson 3: Adding the Bumper Switch and Printing to the Brain Screen**, students will continue to adapt their TrainingBot by adding a Bumper Switch and learning how to print to the Brain Screen so that their robot is ready to play Team Freeze Tag!
- In **Lesson 4: Team Freeze Tag Competition**, student groups will join together for a classroom competition of Team Freeze Tag, applying what they have learned in the previous Lessons to try to win the game!
- **Lesson 5: Conclusion** wraps up the Unit by introducing students to STEM careers related to the learning they did in this Unit, like Race Engineer; then engages students in a debrief conversation to share their learning, and reflect on their experiences.

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

Teacher as Facilitator in this Unit

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

When preparing to teach, decide how students will interact with the **Learn** section of each Lesson. Suggestions include:

- Whole class instruction - You can share the content in class, for whole group instruction, and facilitate conversations to check student understanding.
- Individual student instruction - If all students can access the content outside of class, you can have students read the Learn content as homework, and complete the CYU questions. In class, discuss the content and answer any questions.

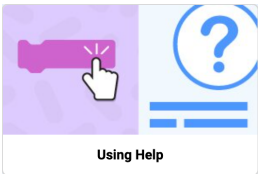
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When preparing to teach, decide how students will interact with the **Practice and Challenge Activities** in each Lesson. Step by step instructions are provided in linked Google docs within the Lesson content. Each Activity sheet can be edited to best meet the needs of your students. You may want to print those Activities out ahead of time, and give them to your students, or project one in the classroom for all students to see at the same time.

This Facilitation Guide will offer reminders and tips for setup and modeling positive classroom culture for each Lesson. You know your students best, so tailor your teaching and Lesson implementation to best suit your students. The Team Freeze Tag Unit is designed to be flexible, so that you can meet students where they are, giving them the time, space, and instruction necessary to make the most of their learning.

Troubleshooting Tips for this Unit

- Be sure that your V5 Brains and Batteries are ready to use. For more information on getting started with V5, see this section of the STEM Library.
- Students will need to have access to VEXcode V5 on their computers or tablets. For more information about installing VEXcode V5, go to code.vex.com, or see the Install section of articles for device-specific information.
- Be sure that your VEXcode V5 firmware is up to date. To learn more about updating firmware, see this article.
- Students can use the built-in Help within VEXcode V5, at any time to learn more about the commands they are using. Students can view the Using Help Tutorial video in VEXcode V5 to learn more about accessing Help.
    - View this article to learn about viewing Tutorial videos in VEXcode V5.



Group Size and Student Collaboration

- A group size of 3 students per V5 Kit is recommended for all Lab activities.
- For strategies to support student collaboration throughout this Unit, see this article
    - Encouraging students to take ownership over certain responsibilities within their groups can help group work become a more student-led process, where all members of the group are participating and engaged in the Lesson.

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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 V5. Encourage students to work vocabulary words into their conversations throughout the Lab, so that they can use the terms confidently and correctly not only in this Lab but also in future V5 experiences. You can use these words as a base list, and adapt them to best meet the needs of your students.

- **Left (drive configuration) -** control the robot completely using the left joystick on the controller
- **Right (drive configuration) -** control the robot completely using the right joystick on the controller
- **Split (drive configuration) -** the left joystick controls the robot going forward and backward, the right joystick controls the robot going from left to right
- **Dual (drive configuration) -** each joystick controls the robot in the forward and reverse direction. Thus, to turn, one joystick will go forward and the other will go in reverse
- **Bumper Switch** - a switch that tells the robot whether its bumper is pressed or released

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VEX V5 Teacher Facilitation Guide
Lesson 1: Introduction

Lesson 1: Introduction Overview

In this Lesson students will be introduced to the culminating competition game, Team Freeze Tag, build the TrainingBot and connect it to the Controller, and set up their engineering notebooks for this Unit.

Prepare Your Classroom:

Have the following spaces and materials ready prior to the start of class:

- A V5 Classroom Kit for each group
- A charged V5 Battery and Controller for each group
- Designated space to build the TrainingBot for each group
- An engineering notebook for each student
- ***Optional***: A 'saving space' for groups to store their Kit and robot for the duration of the Unit.

Reminders and Teacher Tips:

- **Reminder:** Be sure that your Controller firmware is up to date. To learn more about updating firmware, see this article.
- **To ensure that your students are clear on expectations for their engineering notebooks,** have a brief discussion after they watch the video to reinforce what students will be doing with their engineering notebooks in the Unit, and answer any questions they may have.
- **Engage students' prior knowledge** by facilitating conversations as they are building. Compare and contrast this build with any building (robotics or otherwise) they have done previously.
- **Teacher Tip:** If this is students' first time building the TrainingBot, you may want to allow extra time to make sure that students are comfortable with working with Build Instructions and following their roles within the group.
- **Reminder:** Students will need to choose the build instructions that match the V5 Kit they have.
    - Not sure which Kit your students are working with? View this article to learn about the different V5 Kits, to determine which you have. Then direct students to choose the matching build instructions (Classroom Kits vs. Competition Kits).
- For more information about coding and building with VEX V5, see the V5 section of the STEM Library.
- For more information about working with the V5 Controller, see this section of the STEM Library.

Be Mindful of Mindset:

- **Set expectations together for group work and communication** – Students will be working in groups to build the TrainingBot. Before you begin building, take a moment to check in as a whole class about group communication. Set clear expectations for respectful dialogue and assign roles for building within the group, to help ensure that all group members are engaged and working together.

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- For suggested roles for building the TrainingBot, see this article. Remind students of what should be doing when it is not their turn to build, and highlight groups that are following their roles well.

VEX V5 Teacher Facilitation Guide
Lesson 2: Driving with the Controller

Lesson 2: Driving with the Controller Overview

In this Lesson students will learn about how to drive their TrainingBot using the Controller. They will test out each of the driver configurations to see which they would think would be most effective in playing Team Freeze Tag.

Prepare Your Classroom:

Have the following spaces and materials ready prior to the start of class:

- A V5 Classroom Kit for each group
- A charged V5 Battery and Controller for each group
- A prebuilt TrainingBot from the previous Lesson for each group
- **For Practice** you will need:
  - A taped off open space, approximately 4x6 feet (or 120cm x 180cm)
  - 1 'obstacle', like a stack of textbooks, for students to drive around to complete the Drive Around an Obstacle Practice Activity
- **For Compete** you will need:
  - A taped off open space, approximately 5x7 feet (or 150cm x 210cm)
  - 2 'obstacles', like stacks of textbooks, for students to navigate their robot around to complete the Figure Eight Challenge.
- An engineering notebook for each student
- ***Optional***: A 'saving space' for groups to store their Kit and robot for the next Lesson.

Reminders and Teacher Tips:

- As students are learning about the Driver Control program and the four driver control options, facilitate conversations to engage their prior knowledge and draw on their experiences with remote control, or video game driving.
- Students will have different skill levels when it comes to driving with a controller. To ensure that all students have enough time to test out driver control options, allow as much class time as needed for **all** students to complete the Practice activity.
- **Teacher Tip:** Have students prepare for the Challenge Activity on a similar surface to the one they will use for the challenge. Students may notice a difference in how their robot drives on a smooth surface, like a competition Field, as compared to a carpeted surface.
- For more information and support while working with the Driver Control Program and the Controller, see this section of the STEM Library.
- To learn more about running Challenge competitions, including logistics and setup, see this article.

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Be Mindful of Mindset:

- **Promote the idea of "Focus Over Frustration" –** Students may feel frustrated, or self-conscious, about their driving skills, and that is ok. Some may need more practice driving than others, and this may incite a wide range of emotions in students. This is not only ok, it is encouraged! Help students to lean into the learning process, including the potential frustration that can arise when they are not instantly successful. Celebrate perseverance, and highlight students that tried repeatedly, and groups that worked together and helped one another to become better drivers.
    - **What was your 'Focus Over Frustration' moment today?** One way to do this is to wrap up class with a moment to have students articulate for themselves the strategies they used to help them persist to complete an activity, even when they felt frustrated or disappointed.

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VEX V5 Teacher Facilitation Guide
Lesson 3: Adding the Bumper Switch and Printing to the Brain Screen

Lesson 3: Adding the Bumper Switch and Printing to the Brain Screen Overview

In this Lesson students will get ready to compete in the Team Freeze Tag game by adding and using a Bumper Switch with their TrainingBot, learning how to print to the Brain Screen to signal when they have been tagged in a game, and configuring their Controller in VEXcode V5, in preparation for playing the Team Freeze Tag competition game.

Prepare Your Classroom:

Have the following spaces and materials ready prior to the start of class:

- A V5 Classroom Kit for each group
- A charged V5 Battery and Controller for each group
- A prebuilt TrainingBot from the previous Lesson for each group
- A computer or tablet with access to VEXcode V5 for each group.
- **For Practice** you will need:
    - A taped off open space, approximately 4x6 feet (or 120cm x 180cm)
    - 'Obstacles', like stacks of textbooks or a heavy box, for students to drive around to complete the Bumper Press Practice Activity.
    - **Pro Tip:** Set up your space in a corner, to use the walls as additional obstacles, to ensure students get practice triggering the Bumper Switch on their robots.
- **For Compete** you will need:
    - A taped off open space, approximately 5x7 feet (or 150cm x 210cm) to complete the One-on-One Freeze Tag Challenge and play a 1-on-1 game of Freeze Tag!
- An engineering notebook for each student
- ***Optional***: A 'saving space' for groups to store their Kit and robot for the next Lesson.

Reminders and Teacher Tips:

- As students engage with the Learn content, it may be helpful for them to physically manipulate the Bumper Switch, to see and feel things like the amount of pressure needed to trigger the device.
- **Reminder:** Remind students that the Bumper Switch is on the back of the robot, so they should be aware of that when driving in reverse, or turning near an obstacle during the Practice Activity. They may want to trigger the Bumper Switch intentionally to ensure that their project is working as intended.
- As you circulate around the classroom, or as students check in while practicing with the Bumper Switch, facilitate conversations to connect what they learned in the Learn section and previous Lessons, with their experience.
- **Teacher Tip:** If students are struggling to tag as they play One-on-One Freeze Tag**,** try making the challenge space smaller, to encourage closer contact between robots.
- To learn more about running Challenge competitions, including logistics and setup, see this article.

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Be Mindful of Mindset:

- **Encourage Scouting –** As students are continuing to hone their driver skills throughout the Lesson, encourage them to look to other groups' drivers and strategies for inspiration. Students can not only learn within their groups, but from and with other groups in the class. Testing out another group's robot design or driver strategy, and then iterating on it, builds students' capacity for problem solving, thinking flexibly, and collaborating.
    - Build this into your Lesson by having a **'Driver Pro-Tips' time**, where students can share some of their driving techniques and strategies, and explain how their groups worked together to better their driving skills. Have students document what they learn, and what ideas it prompts in their engineering notebook, which they can refer to when preparing for the classroom competition.

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VEX V5 Teacher Facilitation Guide
Lesson 4: Team Freeze Tag Competition

Lesson 4: Team Freeze Tag Competition Overview

In this Lesson students will apply what they learned to compete in a Team Freeze Tag classroom competition! Groups will come together to form teams (2 groups per team), and will compete two on two, to tag their opponents. First they will have an opportunity to develop a game strategy and add onto their TrainingBot, then they will compete in a team competition.

- **To learn more about running a classroom competition, like logistics and setup**, see this article.
- **To learn more about facilitation strategies for classroom competitions**, see this article.

Prepare Your Classroom:

Have the following spaces and materials ready prior to the start of class:

- A V5 Classroom Kit for each group
- A charged V5 Battery and Controller for each group
- A computer or tablet with access to VEXcode V5 for each group.
- A prebuilt TrainingBot with Bumper Switch from the previous Lesson for each group
- **A Competition Field area**:
    - A taped off open space, approximately 5x7 feet (or 150cm x 210cm) on which to play the Team Freeze Tag Competition
    - A stopwatch or timer for keeping time during the matches
- An engineering notebook for each student
- A 'practice space' for teams to practice and refine their strategy as they get ready to compete.
- 'Team meeting' spaces, for teams to meet to iterate on game strategy and their robots.
- ***Optional:*** Labels for each space in the classroom, with notes on the board for students to reference as they move through the room during the Competition
- A team listing, match schedule, and leaderboard
    - To learn more about running a classroom competition, like logistics and setup, see this article.

Reminders and Teacher Tips:

- You can use the Team Freeze Tag Competition Activity Document to print or project and share with students throughout the Lesson.
- **Reminder:** Remind students that the Engineering Design Process should be applied many times throughout the competition. In their teams, they should choose one thing at a time to iterate on, and document the changes, the test results, and the implications in their engineering notebooks.
- **Teacher Tip:** Prior to class, assign teams and have the teams posted in a visible place in the classroom, so that students can easily identify their partners from the start of the Lesson.
- Encourage students to use the match schedule to set parameters and time limits for their team's iterations between matches.
- If students are struggling to find a game strategy, offer them some examples to get started:

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    - **Play Defense** - Protect your Bumper Switches at all times by trying to keep the back of your robot facing the outside edges of the competition area. Drivers will drive mainly forward and in reverse, without a lot of turning, which can be good for less confident drivers. Make the other teams come to you.
    - **Play Offense -** If your team has strong driving skills, move quickly around the Field to 'chase' the other team and tag them. Use your speed and turning agility to make it difficult for the other team to tag you.
    - **Split Strategy -** Have one robot be a more offensive driver and the other more defensive. The offensive driver can try to 'chase' the other team toward the defensive driver, who will then tag them. This works well if there are different driver skill levels in the team.
- **Reminder:** Remind students to document their game strategy iterations in their engineering notebook. If students are struggling with how to document, you can give them options like taking a photograph and annotating it as a place to start.
- To learn more about facilitation strategies for classroom competitions, see this article.

Be Mindful of Mindset:

- **Encourage a balance of voices within teams** – It is sometimes easy for the 'loudest voice' in a group to take control over decision making or strategy, especially as students are in larger groups. Establish practices to be sure that **all** voices are heard before a strategy is tried.
    - You may want to have students write down their game strategy ideas, and engage in a "chalk talk" style discussion, rather than verbally discussing it together, so that quieter students can contribute to the conversation.
    - To help ensure that **all** members of the team have a voice in developing game strategy, talk with students, and ask questions like:
        - What is your team's overall strategy? How did your individual team's strengths and weaknesses factor into the development of your strategy?
        - How is each member of your team involved in strategizing? Can you show me how you are documenting your strategy so far?
- **Continue to reward process over product –** In a competition like Team Freeze Tag, there are many ways that students can demonstrate creative problem solving in their robot design, driving, and strategy. To help keep the process over product mentality alive throughout the competition, reward students for things like unique robot designs, risk taking, team communication, persistence, and more. You know your students best, so tailor your positive reinforcement strategies accordingly.

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VEX IQ Teacher Facilitation Guide
Lesson 5: Conclusion

Lesson 5: Conclusion Overview

In this Lesson, students will reflect on their learning and experiences in the Unit, to share their learning with the class and see how that connects to various career paths.

Facilitating Career Connection

- **Make It Personal** - There are two career connections offered in the Unit, but you can adapt those to offer different career connections that may be better suited to your students. If you have a class parent that works in a related field, or your students have expressed interest in a particular career path that relates to the Unit, find ways to incorporate those personal connections to deepen students' engagement.
- **Facilitating the Choice Board -** Consider how you want students to interact with the Choice Board. The goal of the Choice Board is to give students an opportunity to express voice and choice in their learning, so think about the following as your plan your lesson:
    - Will students choose activities individually or in their groups?
    - When and how will students complete the task?
    - How will they share their learning?
    - Can students complete more than one Choice Board activity?

  The Choice Board can also be adapted with activities that are better suited to your students.

Facilitating the Debrief Conversation

- **Be Mindful of Mindset** - In order for student self-assessment to be meaningful, students must feel comfortable to share their learning, mistakes and all, with their teacher, without fear of penalty or retribution. Throughout your conversations and activities, ensure that students are constructively working together, and give feedback to support that. To learn more about building student resilience and giving effective feedback, see this article.
- **Teacher Tip:** Your preparation for Debrief Conversations can help you make the most of this opportunity with your students. View this article to learn more about having effective Debrief Conversations with your students.
- **Organize Debrief Conversations** - You may want to set up a schedule so that students can sign up for debrief conversations as they are ready. Be sure that students have access to the rubric that will be used for the Debrief Conversation. (This rubric is an editable Google doc, that you can customize to meet your needs and the needs of your students.)
- **Conclusion Activities -** Make sure that students have something to do while they are waiting for their debrief conversation with you. If students finish their self reflection early they can:
    - **Add to their engineering notebook** - Continue to document their final build with images or sketches, journal about the competition experience, or add to their self assessments.
    - **Clean up from Competition** - If you do not want students to bring their robots to the debrief conversation, they can begin to take them apart and put the pieces away.

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- **Explore a Career Connection** - Have students complete an additional Choice Board activity, or the same activity for a different career.
- **Build a Bulletin Board** - Have students create a bulletin board space that reflects their learning throughout the Unit using elements from their engineering notebooks.

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