NAVAL CAREERS

EXPLOSIVE ORDINANCE DISPOSAL TECHNICIAN

BACKGROUND

Americans live for fireworks on the 4th of July. The other 364 days of the year, Explosive Ordnance Disposal (EOD) Technicians and Officers are doing all they can to prevent them. Using advanced tools like cutting-edge robotic technology and explosives chemistry, this elite group performs missions that require immense bravery— from jumping out of airplanes to blowing up underwater mines. This job is no cake walk- you have to be smart, tough, quick-thinking and cool under pressure — and you have to do it all in a 70lb explosive proof suit.

As an EOD Tech, you will receive extensive training to perform missions neutralizing explosive weapons in almost every environment. Duties include:

- Detonate and demolish hazardous munitions, pyrotechnics and outdated explosives
- Neutralize various ordnance, including sea mines, torpedoes or depth charges
- Work with cutting-edge technology to remotely disable unsafe ordnance
- Perform parachute or helicopter insertion operations
- Support law enforcement agencies
- Clear waterways of mines in support of our ships and submarines
- Lend your skills and support to other military units or offices, such as the U.S. Secret Service or the U.S. State Department

TEACHER FACILITATION GUIDE

TREASURE HUNT UNIT

A NOTE ABOUT IMPLEMENTING VEX IQ (2ND GENERATION) STEM LABS:

STEM Labs are designed to be an interactive Unit of instruction that you can use with your students to implement VEX IQ (2nd generation) 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 with VEX IQ (2nd generation). For more detailed information about implementing STEM Labs in your classroom, visit VEX PD+ for videos, expert tips, and more.

Student facing Web based lesson for Treasure Hunt

UNIT OVERVIEW

In the Treasure Hunt Unit, students will use VEXcode IQ to drive their Simple Clawbot as they explore how to code motors and the Optical Sensor to recognize and collect red cubes, in preparation for a Treasure Hunt competition. Students will learn about coding concepts like conditional statements and simple loops as they practice and iterate for the competition.

- In **Lesson 1: Introduction** students will build the Simple Clawbot and be introduced to the challenge of Treasure Hunt.
- In **Lesson 2: Claw No Sensor**, students will use their Simple Clawbot to collect and move cubes, to learn about how to use Drivetrain and Motion blocks in VEXcode IQ to drive their robot autonomously.
- In **Lesson 3: Claw With Sensor**, students will add an Optical Sensor to their robot, and learn about how to code it to detect, collect, and move a red cube.
- In **Lesson 4: Treasure Hunt Competition**, student groups will participate in a classroom competition of Treasure Hunt, applying what they have learned throughout the Unit to try to win the game with the fastest time.
- The **Lesson 5: Conclusion** wraps up the Unit by introducing students to STEM careers related to the learning they did in this Unit, like Software 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 Treasure Hunt 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 a 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 alongside the Lesson Summary document, 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 Lesson Summary and watch the Learn content as homework, then complete the CYU questions. In class, discuss the content and answer any questions.

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

GROUP SIZE AND STUDENT COLLABORATION

- A group size of 3 students per VEX IQ 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.

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 IQ. 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 VEX IQ experiences. You can use these words as a base list, and adapt them to best meet the needs of your students.

- **Autonomous** - robot movement that is entirely controlled by a coding project, without any driver control
- **Drivetrain** - a mechanism that consists of two or more motors, and wheels, that make a robot move
- **Path Planning** - the process of decomposing a project into the smallest possible behaviors that you can then attach code to
- **Sequence** - The order in which blocks are executed, one after another.
- **Optical Sensor** - A sensor that can detect the brightness and color of objects, and identify if an object is near or far away
- **Boolean condition** - a hexagonal reporter block that reports a value of TRUE or FALSE
- **Loop** - a repeating set of robot behaviors

TEACHER FACILITATION GUIDE
LESSON 1: INTRODUCTION

LESSON 1: INTRODUCTION OVERVIEW

In this Lesson students will be introduced to the culminating competition game, Treasure Hunt, build the Simple Clawbot, 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:

- ☐ An VEX IQ Kit for each group
- ☐ A charged VEX IQ Battery for each group
- ☐ A computer or tablet with access to VEXcode IQ for each group (see the Install section of articles for device-specific installation information)
- ☐ Designated space to build the Simple Clawbot for each group
- ☐ An engineering notebook for each student
- ☐ ***Optional***: A 'saving space' for groups to store their VEX IQ Kit and Simple Clawbot for the duration of the Unit.

REMINDERS AND TEACHER TIPS

- **Reminder:** Be sure that your VEXcode IQ firmware is up to date. To learn more about updating firmware, you can view the **Updating Firmware** tutorial video, or 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, and compare and contrast this build with those they have done previously.
- **To further support students as they are getting started with VEXcode IQ**, you can use the following resources:
  - For help with pairing the Brain to VEXcode IQ, see this section of articles.
  - For help with using Templates, like the Simple Clawbot one, have students watch the **Use Example Projects and Templates** tutorial video.
  - For help with naming and saving projects, see these device-specific articles.
  - For help with downloading and running projects, have students watch the **Download and Run a Project** tutorial video.

BE MINDFUL OF MINDSET

- **Set clear expectations for respectful collaboration** – Students will be working in groups to build the Simple Clawbot. (For suggested roles for building the Simple Clawbot, see this article.) Set clear expectations for how group work should function before beginning, to help ensure that all group members are engaged and working together in respectful ways.
  - Highlight groups where students are actively engaged while waiting for their turn to build. Have students share their thought processes with the class, by asking questions like,
    - What is something your team does while you are building that is helpful to you?

- What is something that you do while your teammate is building that helps your team complete the build more efficiently?

Talking about this may highlight that some groups work differently than others. This is a great time to reinforce respectful communication in the face of differing opinions about what is or isn't helpful to someone. You may want to keep a running list of 'helpful ideas' generated in this conversation posted in the classroom, for students to refer to whenever they are engaged in collaborative building.

TEACHER FACILITATION GUIDE
LESSON 2: CLAW NO SENSOR

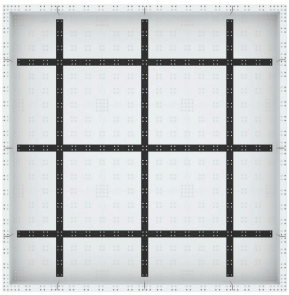
LESSON 2: CLAW NO SENSOR OVERVIEW

In this Lesson students will learn how to code their Simple Clawbot to drive specific distances and open and close the claw. They will explore these concepts by coding their robots to drive and collect cubes on a Field, so that they can prepare for the Treasure Hunt Competition.

PREPARE YOUR CLASSROOM

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

- ☐ A VEX IQ Kit for each group
- ☐ A charged VEX IQ Battery for each group
- ☐ A computer or tablet with access to VEXcode IQ for each group.
- ☐ A prebuilt Simple Clawbot from the previous Lesson for each group
- ☐ A VEX IQ Field that is 3 Tiles by 3 Tiles with walls, as shown in the image below.



Note: If you do not have a Field, you can tape out a 90cm (~3 ft) by 90cm (~3ft) space on a floor or other flat surface.

- ☐ An engineering notebook for each student
- ☐ ***Optional:*** A 'saving space' for groups to store their VEX IQ Kit and Simple Clawbot for the next Lesson.
- ☐ **For Practice:** You will need 1 IQ Cube to set up and complete the Capture the Cube Practice Activity.
- ☐ **For Compete:** You will need 3 IQ Cubes, and a timer or stopwatch, to set up and complete the Clawbot Collector Challenge.

REMINDERS AND TEACHER TIPS

- As students are learning about coding their robots to drive and collect cubes autonomously, facilitate conversations to engage their prior knowledge, and draw on their experiences with autonomous driving projects.
- **Teacher Tip:** Help students to decompose and plan their projects prior to beginning to code. They can write down the pseudocode in their engineering notebooks, and transfer it to comment blocks when they begin their projects.
- To ensure that all students have a clear understanding of how to code their robot to move cubes autonomously, allow as much class time as needed for all students to complete the Practice Activity.
- **Teacher Tip:** Students can build on their projects from Practice, for the Compete section of the Lesson. Rather than completely starting from scratch, encourage students to use their projects from Practice as a base.
- **Reminder:** Remind students to document important details, like the degrees needed to open and close the claw, in their engineering notebook, so they can refer back to those notes during future Lessons or projects.
- To learn more about facilitating Challenge competitions, including logistics and setup, see this article.

BE MINDFUL OF MINDSET

- **Frustration is natural, and it is okay** – It may take students several attempts to successfully collect cubes with their robot. This may incite a wide range of emotions in students. This is not only okay, it is encouraged! Help students to lean into the iterative process, including the potential frustration that can arise when they are not instantly successful. Celebrate perseverance, and highlight groups that tried repeatedly, worked together, and maintained focus through the frustration.
    - 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 learn from their mistakes and persist, even when they felt frustrated or disappointed.

TEACHER FACILITATION GUIDE
LESSON 3: CLAW WITH SENSOR

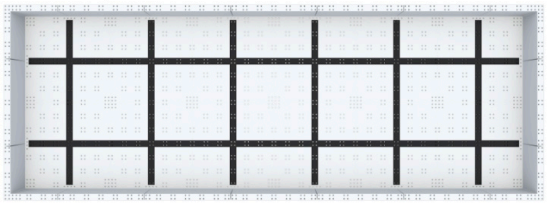
LESSON 3: CLAW WITH SENSOR OVERVIEW

In this Lesson students will learn about the Optical Sensor, and how it can be used to detect colors. Students will add the Optical Sensor to their Simple Clawbot, and will code their robot to identify red cubes, and collect only those, as they prepare for the Treasure Hunt competition.

PREPARE YOUR CLASSROOM

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

- ☐ A VEX IQ Kit for each group
- ☐ A charged VEX IQ Battery for each group
- ☐ A computer or tablet with access to VEXcode IQ for each group.
- ☐ A prebuilt BaseBot from the previous Lesson for each group
- ☐ A VEX IQ Field that is 2 Tiles by 6 Tiles with walls, as shown in the image below



Note: If you do not have a Field, you can tape out a 60cm (~2 ft) by 180cm (~6 ft) space on a floor or other flat surface.

- ☐ An engineering notebook for each student
- ☐ **Optional:** A 'saving space' for groups to store their VEX IQ Kit and Simple Clawbot for the next Lesson.
- ☐ **For Practice:** You will need 2 IQ Cubes, one of which is red, to set up and complete the Eye Spy Treasure Practice Activity.
- ☐ **For Compete:** You will need 5 IQ Cubes, one of which is red, and a timer or stopwatch, to set up and complete the Treasure Mover Challenge.

REMINDERS AND TEACHER TIPS

- **Teacher Tip:** You can use the Print Console in VEXcode IQ to display the sensor data from the Optical Sensor as students' projects are running. This extra visual can help students make the connection between what data the Optical Sensor reports, and how that connects to the goal of their project.
- **Reminder:** Remind students to take careful and accurate measurements as they are planning their projects, and to document these measurements in their engineering notebooks. Their robot will move precisely, so if the measurements or starting positions are slightly off, their project may not work as intended.
- **Teacher Tip:** You may find that there are varying degrees of coding success across your class. This is a great opportunity to empower your students to learn from and with one another. Have frequent whole class check-ins, where students can ask and answer each other's questions as they are building and testing their projects.
- As in Lesson 2, students can use their projects from the Practice activity as a base for the Compete section.
- **Reminder:** Remind students that their engineering notebooks are designed to be unique to them, and do not need to be perfect. Give options for how to document learning, like sketching or printing photographs of the Simple Clawbot, or offer the class a Field Setup image that they can glue or copy into their notebooks.

- For more information about the Optical Sensor, see this article.
- To learn more about facilitating Challenge competitions, including logistics and setup, see this STEM Lab article.

BE MINDFUL OF MINDSET

- **There is no such thing as "I'm done."** – There is always something that can be further iterated on in a STEM Lab Unit. Students can revisit previous decisions they made about their projects, they can add to their engineering notebooks, they can test different parameters to optimize color sensing, and more. The goal of these Lessons is not to create the 'perfect' project – it is to continue to learn through iteration. As such, iteration is never complete!
    - If students say that they are 'done' during class, have them continue to iterate on a component of their project, like the robot's speed, and document any changes and the rationale behind them in their engineering notebook.

TEACHER FACILITATION GUIDE

LESSON 4: TREASURE HUNT COMPETITION

LESSON 4: TREASURE HUNT COMPETITION OVERVIEW

In this Lesson students will apply what they learned to compete in a Treasure Hunt classroom competition! Teams will compete in timed trials, to collect 2 red Treasure Cubes in the Treasure Chest. The robot that collects both red cubes in the fastest time is the winner. First, students will have an opportunity to develop a game strategy and iterate on their Simple Clawbot and code, then they will compete in the 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 timer or stopwatch
- ☐ A VEX IQ Kit for each group
- ☐ A charged VEX IQ Battery for each group
- ☐ A computer or tablet with access to VEXcode IQ for each group.
- ☐ A prebuilt Simple Clawbot from the previous Lesson for each group
- ☐ A VEX IQ Field that is 2 Tile by 6 Tiles with walls for the Competition Matches (as in the previous Lesson). **Note**: If you do not have a Field, you can tape out a 60cm (~2 ft) by 180cm (~6ft) space on a floor or other flat surface.
- ☐ An engineering notebook for each student
- ☐ A 'practice space' for teams to practice and refine their strategy and code as they get ready to compete.
- ☐ 'Team meeting' spaces, for teams to meet together, to iterate on game strategy and their robots and code.
- ☐ ***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 match schedule and leaderboard
    - ☐ To learn more about running a classroom competition, like logistics and setup, see this article.

REMINDERS AND TEACHER TIPS

- Encourage students to use the match schedule to set parameters and time limits for teams' iterations between matches.
- You can use the Treasure Hunt 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.
- If students are struggling to identify a starting point for the engineering design process, ask questions to get them thinking, like:
    - How is your robot's design going to help you get the fastest time? Is there anything you could add or change about the claw or the location of the Optical Sensor to make it more efficient?

    - How is your project optimized for time? Is there anything you could add or change to make your robot faster?
- **Teacher Tip:** During the iterative process, students may make incorrect assumptions or predictions about how their changes will affect the robot's performance - that is okay. Give students the space to make mistakes and to learn from those mistakes, so that they can engage in authentic problem solving and evidence-based iteration.
- To learn more about facilitation strategies for classroom competitions, see this article.

BE MINDFUL OF MINDSET

- **Highlight the quieter voices** – It is sometimes easy for the 'loudest voice' in a group to take control over decision making or strategy. Establish practices to be sure that all voices are heard before a strategy is tried. You may want to have students document their ideas for a game strategy individually, before they begin verbally discussing it together, so that students who may be quieter can still contribute to the conversation.
    - To help ensure that **all** members of the team have a voice in developing game strategy, circulate around the room as students are working, or have they check in with you, and ask questions like:
        - Can everyone on your team explain your game strategy to me? How did you come to an agreement about your approach? Were there any other ideas that you might want to try?
        - How is each member of your team involved in strategizing? Can you show me how you are documenting your strategy so far?
- **Encourage Scouting** – As students are watching other team's compete, remind them that they can scout robot design ideas as well as coding ideas. You may want to project students' VEXcode projects during the competition, so that others can more easily see them.
    - Remind students that they can use others' projects as a basis for their own iterations, and that the purpose of displaying projects is to aid in iteration and not to promote students blindly copying the work of others.
        - To make sure that students understand what they are building into their projects, check in with groups and have them explain how they incorporated others' code into their projects. If they are struggling to do this, talk through the project together.
- **Continue to reward process over product** – In a competition like Treasure Hunt, students may fall into the default mindset that only the fastest robot in the class is the 'winner'. To help keep the process over product mentality alive throughout the competition reward students for unique robot designs, risk taking throughout the Unit, strong group work, persistence and perseverance, collaboration, communication, and more. This can be in the form of 'superlative' certificates, or a non-tangible reward like having an extra privilege in class. You know your students best, so tailor your positive reinforcement accordingly.

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 know someone 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:** Meaningful student self-assessment can only occur if students feel comfortable and confident that they can be honest and vulnerable without being penalized for it. Be cognizant of your teacher language as you talk about progress and mistakes or misconceptions throughout the Unit. How you are engaging with students throughout your class time will lay the foundations for self-assessment that genuinely reflects and supports students' learning.
- **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(s) that will be used for the Debrief Conversation. (These rubrics are editable Google docs, 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.
    - **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.