# Robotics Exploration
# HSTCH 130

| UNIT NAME | LESSONS | LEARNING TARGETS/ OBJECTIVES | Resources (Suggested Activities) | ASSESSMENT | CROSS CURRICULUM CONNECTIONS |
|---|---|---|---|---|---|
| Team Freeze Tag | Introduction | In this Lesson, students will learn how to add and use a Bumper Switch with their BaseBot. Students will also learn how to print to the Brain's screen, and configure their Controller using VEXcode EXP. Then, students will apply these skills to compete in the Freeze Tag Challenge, where they will play a game of one-on-one Freeze Tag. | Introduction \| VEX Education Lesson<br><br>BaseBot Build Instructions<br><br>Building the BaseBot Video<br><br>Teacher Portal Unit Materials<br><br>Unit Facilitation Guide | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |
| | Driving with the EXP Controller | In this Lesson, students will learn how to drive the BaseBot using the Controller and the predetermined driver configurations on the Brain. Then, students will apply these skills to compete in the Drive a Figure | Driving with the EXP Controller Lesson | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | Eight challenge, where they will navigate around two EXP Buckyballs. | | | |
| | Changing the Wheels | In this Lesson, students will learn how to change the wheels on the BaseBot and test its performance with different wheel combinations to improve their speed in the Figure Eight Wheel challenge. This challenge will seem familiar since it was also used in Lesson 2, but students will be optimizing your robot by altering the wheel combinations to improve their driving. | Changing the Wheels Lesson | Same as above | Engineering Math Science |
| | Adding the Bumper Switch and Printing to the Brain | In this Lesson, students will learn how to add and use a Bumper Switch with their BaseBot. Students will also learn how to print to the Brain's screen, and configure their Controller using VEXcode EXP. Then, students will apply these skills to compete in the Freeze Tag Challenge, where they will play a game of one-on-one Freeze Tag. | Adding the Bumper Switch and Printing to the Brain Lesson | Same as above | Engineering Math Science |
| | Team Freeze Tag Competition | Now it is time to compete in the Team Freeze Tag Competition! Apply all the things students have previously learned to the Team Freeze Tag Competition. | Team Freeze Tag Competition Lesson | Same as above | Engineering Math Science |
| | Conclusion | Now that you have completed all of the challenge activities and the | | Unit assessment will be done through | Engineering Math |

| | | | | | |
|---|---|---|---|---|---|
| | | Team Freeze Tag Competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | the results competition, debrief conversation and engineering notebook<br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | Science |
| Robot Soccer | Introduction | In this Unit, you will explore how to create a manipulator on your robot to grab, pass, and score the most goals as a robot soccer player in the Robot Soccer competition!<br>Visit the Teacher's Portal for teacher support materials and videos about the content and facilitation of the Robot Soccer Lessons.<br><br>In this Unit, you will learn how to play Robot Soccer with your Clawbot! Robot Soccer is played in matches of two robots versus two robots. Your team will need to move a Buckyball through your opponent's goal to score! During this Unit, you | Lesson Introduction<br><br>Teachers Portal Unit Materials<br><br>Clawbot Build Instructions<br><br>Unit Facilitation Guide | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | will learn about various manipulators that can help your team to score more goals. Watch the animation below to see an example of Robot Soccer game play in action! | | | |
| | Manipulators | In this Lesson, you will learn about what a manipulator is, the difference between passive and active manipulators, and how to design an effective manipulator to make your robot accomplish a task. You will learn about intake manipulators, and how to code an intake in a project for your robot. You will also learn about how to assign a Drivetrain to your Controller's joysticks, and using motor groups, so that you can prepare to optimize your robot for playing Robot Soccer. You will apply this information to design and build a manipulator for your robot to compete in the One-on-One Robot Soccer Challenge. | Manipulators Lesson<br><br>Manipulator Summary<br><br>Intake Design Summary<br><br>Motor Groups Summary<br><br>Assigning Joysticks to Motors Summary | Same as above | Engineering<br>Math<br>Science |
| | Robot Soccer Competition | Now it is time to compete in the Robot Soccer competition! In this two-on-two driver control competition, your robot will play on a team with a second robot. Together, you will try to score as | Robot Soccer Competition Lesson<br><br>Engineering Design Prcess Poster | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | many goals as possible by moving the Buckyball into the opposing team's goal. Each match is 60 seconds of playing time, and the timer will stop after each goal to reset the robots and Buckyball on the Field. The team with the most goals at the end of the match wins! Watch the video below to learn the process you can use to apply all the things you have previously learned to the Robot Soccer competition. | | | |
| | Conclusion | Now that you have completed all of the challenge activities and the Robot Soccer competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook<br><br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| Up and Over | Introduction | In this Unit, you will learn how to play in the Up and Over competition with your Clawbot. You will iterate on the Clawbot build and game strategy to improve the robot's performance and score more points! | Up and Over Lesson Introduction<br><br>Check Batteries and Pair Controller<br>Clawbot Build Instructions | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |
| | Claw Design | In this Lesson you will learn about what a claw is, and how to design an effective claw to accomplish a particular task. You will also learn about the concept of scouting, and how you can take inspiration from other robots to inform your design decisions. Then, you will apply your learning to collect Buckyballs with your Clawbot in the Grab and Go Challenge. | Clawbot Design Lesson<br><br>Up and Over Practice<br><br>Grab and Go Activity | Same as above | Engineering<br>Math<br>Science |
| | Arm Designs | In this Lesson you will learn about what robotic arms are, how they work, and what makes an effective arm design. Then, you will apply your learning to stack as many Buckyballs onto rings as you can within a minute in the Stacked Up challenge. | Arm Design Lesson<br><br>Different Arm Designs and Practice<br><br>Stacked Up Competition | Same as above | Engineering<br>Math<br>Science |
| | Motor Groups | In this Lesson you will learn about motor groups, why you should use them, and how to configure motor groups in VEXcode EXP. You will also | Motor Groups Lesson | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | learn about how to choose a driver for your team in a fair and respectful way. Then, you will apply your learning to compete in the Up and Over Challenge, to drive your robot to lift and move Buckyballs up and over a barrier to the other side of the Field! | Over the Barrier Activity<br><br>Up and Over Challenge | | |
| | Up and Over Competition | Now it is time to compete in the Up and Over competition! In this one-on-one, driver control competition, your robot will try to score as many points as possible in your scoring zone, by moving colored Buckyballs up and over the barrier on the Field. The robot with the most points in their scoring zone at the end of the 60-second match wins! Watch the video below to learn the process you can use to apply all the things you have previously learned to the Up and Over competition. | Up and Over Competition and Reflection | Same as above | Engineering<br>Math<br>Science |
| | Conclusion | Now that you have completed all of the challenge activities and the Up and Over competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | |
| Ring Leader | Introduction | his Unit, you will learn how to play the Ring Leader Competition with your Clawbot. You will iterate on your code and game strategy to improve the robot's performance in both driver control and autonomous challenges to score more points! Watch the animation below to see an example of the Ring Leader Competition. | Introduction Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |
| | Driver Control | In this Lesson you will learn how to use the Driver Control program on the EXP Brain to move the Clawbot, and practice driving with different driver control configurations. Then, you will apply your learning to pick up and score two rings in the Speed and Score Challenge. | Driver Control Lesson<br><br>Ring Leader Practice<br><br>Speed and Score Challenge | Same as above | Engineering<br>Math<br>Science |
| | Coding for Autonomous Movements | In this Lesson you will learn about coding your robot to complete autonomous movements and how to succeed in an autonomous | Path Planning Lesson | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | challenge. Then, you will apply your learning by creating a VEXcode EXP project to pick up and place two rings on the small post in the Coding Crunch Challenge. | Coding Crunch Challenge | | |
| | Using Multiple Programs (Autonomous & Driver) | In this Lesson, you will learn about customizing driver controls, and the differences between strategizing for driver control and autonomous movement. You will look at how you can use the Controller and VEXcode EXP to optimize your competition strategy for the Split Decision challenge. You will also learn how to save multiple programs on your EXP Brain to switch between different programs quickly and easily. | Customizing Driver Control Lesson<br><br>Split Decision Challenge | Same as above | Engineering<br>Math<br>Science<br>Engineering<br>Math<br>Science |
| | Ring Leader Competition | Now it is time to compete in the Ring Leader Competition! Ring Leader is played in two 1-minute trial runs. One run is autonomous, and the other is driver control. Score the most points by collecting rings and placing them on posts on the Field. Watch the video below to learn the process you can use to apply all the things you have previously learned to the Ring Leader Competition. | Ring Leader Competition<br><br>Wrap Up Reflection | Same as above | Engineering<br>Math<br>Science |
| | Conclusion | Now that you have completed all of the challenge activities and the Ring Leader competition, it is time to look | Conclusion Lesson | Unit assessment will be done through the results | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | | competition, debrief conversation and engineering notebook<br><br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | |
| Castle Crasher | Introduction | In this Unit, you will learn how to play Castle Crasher with your BaseBot! Castle Crasher is a timed trial competition, where your robot will move autonomously to push all Buckyballs off of the Field in the fastest time. You will learn ways to make your code more efficient throughout the Unit. Watch the animation below to see an example of how a robot could autonomously move during a successful run in the Castle Crasher competition. | Introduction Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering Math Science |
| | Castle Crasher No Sensors | In this Lesson you will learn how to plan a path and code your robot to drive and turn. Then, you will apply this information to push Buckyballs | Coding the Drivetrain Lesson | Same as above | Engineering Math Science |

| | | | | | |
|---|---|---|---|---|---|
| | | off of the Field in the Buckyball Blitz Challenge. | Buckyball Blitz Challenge | | |
| | Castle Crasher + Distance Sensor | In this Lesson you will learn about the Distance Sensor, and how data from the Distance Sensor can be used in a project to detect objects. You will also learn about the [Wait until] block, and how that can be used in a VEXcode EXP project to have your robot make a decision. Then, you will apply your learning to detect and move Buckyballs with your BaseBot in the Sense and Sweep Challenge. | Add a Distance Sensor Lesson<br><br>[Wait Until] Block Lesson<br><br>Sense and Sweep Challenge | Same as above | Engineering<br>Math<br>Science |
| | Creating Algorithms | In this Lesson, you will learn about the Optical Sensor, and how you can use sensor feedback to optimize your strategy and your code for playing Castle Crasher. You will also learn how to create an algorithm to code your robot to autonomously find Buckyballs and complete the Sweep the Field challenge. | Optical Sensor Lesson<br><br>Sweep the Field Challenge | Same as above | Engineering<br>Math<br>Science |
| | Castle Crasher Competition | Now it is time to compete in the Castle Crasher competition! In this autonomous competition, your robot will try to score as many points as possible by crashing 'castles' and knocking the Buckyballs off the Field. Each Buckyball that is | Castle Crasher Competition | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | cleared during the match is worth one point, and the robot with the most points, wins! Code your robot to seek out, crash, and clear castles – but watch out, you don't want to fall off the Field! | | | |
| | Conclusion | Now that you have completed all of the challenge activities and the Castle Crasher competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook<br><br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | Engineering<br>Math<br>Science |
| Treasure Hunt | Introduction | In this Unit, you will learn how to play Treasure Hunt with your Clawbot! Treasure Hunt is a timed trial competition, where your robot will move autonomously to collect red Treasure Buckyballs on the Field in the fastest time. Your robot will need to check each Buckyball along | Introduction Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | the Field as part of its run, and you will learn ways to make your code more efficient throughout the Unit. | | | |
| | Claw No Sensor | In this Lesson you will learn about how to code your robot to drive and use the claw autonomously, and how path planning can help you accomplish this task more easily. Then, you will apply this information to collect Buckyballs with your Clawbot the fastest in the Collector Challenge. | Coding the Drivetrain Lesson<br><br>Collector Challenge | Same as above | Engineering<br>Math<br>Science |
| | Claw With Sensor | In this Lesson you will learn about the Optical Sensor, and how it can be used with [If then] and [Repeat] blocks in a project to make your Clawbot collect a Buckyball based on its color. Then you will apply what you have learned to compete in the Treasure Mover Challenge, where your robot will need to collect only the red Treasure Buckyball. | Optical Sensor Lesson<br><br>Treasure Mover Challenge | Same as above | Engineering<br>Math<br>Science |
| | Treasure Hunt Competition | Now it is time to compete in the Treasure Hunt competition! In this timed trial competition, your robot will need to check the Buckyballs on the Field, collect both red Treasure Buckyballs, and deliver them to the Treasure Chest in the fastest time. | Treasure Hunt Competition<br><br>Competition Reflection Lesson | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | Conclusion | Now that you have completed all of the challenge activities and the Treasure Hunt competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook<br><br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | Engineering<br>Math<br>Science |
| Platform Placer | Introduction | In this Unit, you will learn how to play Platform Placer with your Clawbot! Platform Placer is played using driver control, and is a cooperative game. Two robots will work together to place Buckyballs and rings on low, medium, and high platforms to achieve the highest possible score. Teams will learn to design manipulators and lifts, and combine this with driver skills to develop a winning strategy for the competition. | Introduction Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | Manipulating Various Objects | In this Lesson you will learn about the difference between passive and active manipulators, and how to design an effective manipulator to make your robot accomplish a particular task. Then, you will apply this information to score rings and Buckyballs in the Push and Place Challenge. | Manipulators Lesson<br><br>Push and Place Challenge | Same as above | Engineering<br>Math<br>Science |
| | Designing Lifts | In this Lesson you will learn about lifts, and how you can design a lift to help your robot accomplish a task, like raising a Buckyball to a higher location. You will also learn about motor groups, and how you can code motor groups to function as one device, so you can control lifts or other manipulators more easily. Then, you will apply your learning to lift and score game objects on a low, medium, and high platform in the Lift and Score Challenge. | Lift Design Lesson<br><br>Lift and Score Challenge | Same as above | Engineering<br>Math<br>Science |
| | Developing a Strategy | In this Lesson, you will learn about developing a game strategy, and the steps you can take to organize your team around strategy development, to help you as you work towards the Platform Placer competition. You will practice the process of developing a strategy with your team, and then together with another team to compete | Developing a Strategy Lesson<br><br>Strategize and Score Practice<br><br>Shared Strategy Challenge | Same as above | Engineering<br>Math<br>Science |

| | | | | | |
|---|---|---|---|---|---|
| | | cooperatively in the Shared Strategy Challenge. | | | |
| | Platform Placer Competition | Now it is time to compete in the Platform Placer competition! In this cooperative driver control competition, you will develop a game strategy to use two robots to place game objects on low, medium and high platforms in order to achieve the highest possible score in two minutes. | Platform Placer Competition<br><br>Reflection Lesson | Same as above | Engineering<br>Math<br>Science |
| | Conclusion | Now that you have completed all of the challenge activities and the Platform Placer competition, it is time to look back on what you have learned in this Unit, share that learning with your class, and see how these skills have connections in various career paths. | Conclusion Lesson | Unit assessment will be done through the results competition, debrief conversation and engineering notebook<br><br>Debrief Conversation Rubric<br><br>Engineering Notebook Rubric<br><br>Other Grading Rubics | Engineering<br>Math<br>Science |