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| **Title** | Sensors, Sensors…..Everywhere!  Middle School Meteorologist Create Weather Bots! |
| **Introduction** | During this unit students will be learning about sensors. Sensors are used to give computers/robots/electrical devices senses like a human. They will allow computer equipment to see, hear, feel and touch. Students will complete a meteorology activity using the TI SensorTag. Upon completion of the meteorology activity, students will create a Weather Bot using the Vex robotics sensors and kit to help forecast the weather.  Q: What type of sensors do you know about? <http://www.discoversensors.ie/sensors>. |
| **Real Science Application** | Sensors are used to monitor everything from weather to a patient’s hearing condition. Sensors are devices that convert a physical parameter such as room temperature, blood pressure or wind speed into a signal that can be measured electrically. ([www.sensorsweb.com](http://www.sensorsweb.com/)). Sensor technology holds great value for education. It can be used to improve teaching and learning in science across a broad range of age and abilities. There are a vast number of sensors available including heart rate, electrical voltage, gas, light, sound, temperature and distance sensors, which are connected to a data-logging device or directly to a computer. The data is collected by the sensors and then transmitted to the computer. The computers uses software to collect, display and store the experimental data. The software can then display this data in different formats - such as graphs, tables or meter readings, which make it easier for the students to understand the process and bring science to life. |

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| **Curriculum Alignment** | **Science Objectives**  ***Objective 7.E.1.4*** *Predict weather conditions and patterns based on information obtained from: weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure), weather maps, satellites and radar , cloud shapes and types and associated elevation*  **Automation & Robotics Objectives – Technology & Literacy**   * *Standard 1:  Students will develop an understanding of the characteristics and scope of technology* * *Standard 3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.* * *Standard 10:  Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.* * *Standard 12:  Students will develop the abilities to use and maintain technological products and systems.* |
| **Learning Outcomes** | * Participants will use appropriate sensors to predict the weather * Participants will explore the TI SensorTag * Participants will make an hypothesis about the weather trends * Participants will appropriately record and graph data * Participants will compose a journal to reflect on their weather observations * Participants will present their information and graphs to the class * Participants will explore Vex robotics sensors * Participants will create a “Weather Bot” robot using knowledge of Vex sensors to help monitor weather trends * Participates will explore the STEM career field of meteorology and mechanical engineering |
| **Time Required and Location** | 45 minute class period (M-F) – 7th & 8th Grade  4 Weeks  Week 1 (TI Sensor Exploration/Vex Sensor Exploration)  Weeks 1-3 (Build, Program & Test Weather Bot)  Or  Fifteen (15) – 45 minutes classes |

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| **Materials Needed** | Facilitator List   * Using Sensors (YouTube) - **Video:** <https://www.youtube.com/watch?v=v25PCV_IJCw> * **Middle School Meteorologist PowerPoint** <http://tinyurl.com/qbo5y5p> * Lap Report Rubric - <http://tinyurl.com/q2td7pr> * Collaborative Work Rubric- <http://tinyurl.com/o73fc5v> * Oral Presentation Rubric- <http://tinyurl.com/omyrqys> * Middle School Meteorologist PowerPoint <http://tinyurl.com/qbo5y5p> * Video**:** <https://www.youtube.com/watch?v=v25PCV_IJCw> * How to Use Google Classroom - <https://www.youtube.com/watch?v=EQs5lnsL0nc> * How To Use & Program A Bump Switch - <https://www.youtube.com/watch?v=pZMF5hsfc1M> * Building Guide Bump Switch – <http://tinyurl.com/qxqr3ey> * How To Use & Program A Limit Switch -  [https://www.youtube.com/watch?v=M72nK8mXTW0](https://www.youtube.com/watch?v=pZMF5hsfc1M) * Building Guide Limit Switch – <http://tinyurl.com/qxqr3ey> * How To Use & Program Line Follower Sensor - <https://www.youtube.com/watch?v=KxGHbnUpcus> * Building Guide Line Follower – <http://tinyurl.com/qcjh3c8> * D.E.A.L at Neal (Engineering Design Process)- <http://tinyurl.com/qg6xtb9> * Engineering Design Process Rap - <https://www.youtube.com/watch?v=pASRNRlvFVY> * Mind Mapping (X Mind 60) – <http://www.xmind.net/download/win/> *\*\*This software is designed to help students with the ideation process. Before, using this in your classroom, please make sure that it is approved by the tech services department.* * PowerPoint Outline for Weather Bot - <http://tinyurl.com/qgmbzx4> * Vex Inventors Guide - <http://tinyurl.com/nsmzg4z> * Isometric Graph Paper – <http://www.printablepaper.net/category/isometric_graph> * Decision Matrix - <http://tinyurl.com/pteuqqb> * Business Causal vs Business Professional - <http://www.tarleton.edu/careerservices/Students/dress-to-impress.html> * TI SensorTag   + - May be purchase here:   + Humidity   + Barometric Pressure   + Wind Speed and Wind Direction   + Dew Point   + Atmospheric Pressure * Tablets with TI Sensor app uploaded   + Android & Apple Only   + Maybe purchased from [www.camcor.com](http://www.camcor.com) * Vex Robotics Sensors (bump switch, limit switch, line follower) * Plastic Bins   + May be purchased from any home office store * Sharpie/Sticky Notes to Label Bins   + May be purchased from any home office store   Participant List   * Chart paper to graph weather trends * Worksheet with TI sensor questions (include in Meteorologist PowerPoint) * Journal to record observations (scripted) * Vex Robotics Sensors (bump switch, limit switch, line follower) * 1 TI SensorTag per groups of 4-5 * PowerPoint Guide/Things to Include for Your Weather Bot presentation   ***\*\*Please note that resources/tutorials are included in each section of the lesson plan. Vocabulary is included at the end of the unit plan.*** |
| **Safety** | Teacher will review the following rules for collecting data outside using the TI Sensor:   1. Do not run 2. Do not throw the TI Sensor, dirt or rocks 3. Take your clipboard, tablet and TI Sensor with you outside   Teacher will review the following rules for building with Vex robotics:   1. Please do not run with any of the equipment 2. Do not throw any of the Vex equipment 3. Do not put any of the Vex equipment in your mouth |
| **Participant Prior Knowledge** | The final product for this unit plan is the Weather Bot. Teacher will need knowledge of the functions of sensors as well as how they can be used to gather data about weather. Teachers will also need to know how to build and program using the Vex robotics and ROBOT C++. Students should know the proper way to build and have little knowledge of programming. \*\*Note that this unit plan can be used with Lego robots and many other types of robotic kits. |
| **Facilitator Preparations** | * Understand the types of sensors * Understand how to use a TI Sensor and collect data * Reserve tablets and ensure that TI Sensor app is working appropriately * Ensure copies are made for data collection * Ensure student have a clipboard * Ensure students understand how to read data from the TI Sensor app * Ensure students have journal ready (done in Google Classroom) * Understand how to build a sturdy well thought out product to monitor weather conditions * Place students in groups of 4 or 5 |
| **Activities** | ***Day 1 (Week 1)***  Teacher will explain to students that they will be exploring sensors. Teacher will explain to students that will be using Google Classroom to complete Do Now’s as well as reflect on the data they collect for the upcoming Middle Meteorologist assignment. \*If you do not have daily access to computers have students record their responses in a journal or on a piece of paper. ***\*\*Note to teacher, you must have a school issued Gmail accounts in order to use Google Classroom. Once, you set up classroom you will be given a code for students to gain access to your classroom.***  Teacher will also show students how to access their journal in Google Classroom. The teacher will walk around and check student answers. Do Now’s/Warm Ups may be used a pre-assessment or formative assessment. (20 minutes)  **DO NOW:** What are sensors used for? What type of sensors do you know about? ***\*\*Students should write in complete sentences. \*\*After students have completed the entry the teacher should walk around and perform and quick. She may pull out answers and discuss them as a whole group.***  ***DO NOW (Answer):***  Sensors are used to monitor everything from weather to a patient’s hearing condition. Sensors are devices that convert a physical parameter such as room temperature, blood pressure or wind speed into a signal that can be measured electrically.  **SAY:** Today, we will begin by talking about sensors. Sensors are used to provide computers/robots/electrical devices senses like a human. They will allow computer equipment to see, hear, feel and touch. ***\*\*Teacher may ask students to share out their answers.***  Teacher will show videos and real-life examples of sensors and how they work. (5 mins)  **Video:** <https://www.youtube.com/watch?v=v25PCV_IJCw>  **Do Now:** What is the difference between the IR temperature and the ambient temperature?  ***(Answer):***  IR temperature is the taken on the skin and ambient temperature is taken of the environment.  Teacher will teach students how to use the TI Sensor and tablet to collect data. Teacher should show students how to access the app on the tablet. Teacher will review the **Middle School Meteorologist PowerPoint** <http://tinyurl.com/qbo5y5p> . Teacher will show students how to collect the data by reviewing charts as well as creating graphs. ***\*\*Teachers may print the PowerPoint and make student copies.*** Teacher will also remind students of the rubrics outlining processes for behavior, collecting data outside the classroom and presenting their findings. (20 minutes)  **Resources/Links**   * Lap Report Rubric - <http://tinyurl.com/q2td7pr> * Collaborative Work Rubric- <http://tinyurl.com/o73fc5v> * Oral Presentation Rubric- <http://tinyurl.com/omyrqys> * Middle School Meteorologist PowerPoint <http://tinyurl.com/qbo5y5p> * Video**:** <https://www.youtube.com/watch?v=v25PCV_IJCw> * How to Use Google Classroom - <https://www.youtube.com/watch?v=EQs5lnsL0nc>   Teacher will circulate room and provide assistance as needed.  **Day 2 (Week 1)**  Teacher will explain to students that we are continuing to collect weather data. Students will complete a Do Now/journal entry into the electronic journals on Google Classroom. (5 minutes).  **Do Now:** What is the difference between temperature and humidity?  ***DO NOW (Answer):***  Temperature is a measure of the air’s hotness or coldness and is the most measured quantity of the atmosphere. Humidity the amount of water vapor in the air.  **SAY:** After students have completed their Do Now, the teacher will review the behavior expectations for collecting data outside. Students will take about 15 minutes to collect data using their TI sensor. **\*\*Data and charts are included in the Meteorologist PowerPoint.** Students will be collecting data on Barometric pressure and humidity.  When students return, the teacher will explain that students will begin learning about Vex sensors. (15 minutes)  Teacher will explore the various sensors for Vex robotics and the programming for each sensor. The teacher will create a test bed with the various Vex sensors (bump switch, limit switch, and line follower).  Teacher will show students how to the Vex **bump switch** sensor works using videos and a real life demonstration of the Vex testbed. Then, the teacher will show students how to open ROBOT C++ or Easy C and develop code for using the bump switch on their Weather Bot. Teachers should use the video below to learn how to program a Vex bump switch. (25 minutes)  **Resources/Links**   * How To Use & Program A Bump Switch - <https://www.youtube.com/watch?v=pZMF5hsfc1M> * Building Guide Bump Switch – <http://tinyurl.com/qxqr3ey>   **Day 3 (Week 1)**  Teacher will explain to students that we are continuing to collect weather data. Students will complete a Do Now/journal entry into the electronic journals on Google Classroom. (5 minutes).  **Do Now:** How does wind pressure affect the weather?  ***DO NOW (Answer):***  The sea breeze is a good example where the pressure and the wind combined decide the climate of coastal stations. Due to the unequal heating of the land and the adjoining sea surfaces during the day time, air becomes warmer over land and rises creating a low pressure over the land. So cold wind starts moving towards the land to replace the rising warmer air.This is the sea breeze which makes the coastal stations to have a moderate weather throughout the year.  **SAY:** After students have completed their Do Now, the teacher will review answers from Do Now with the class. The teacher will review the behavior expectations for collecting data outside. Students will take about 15 minutes to collect data using their TI sensor. Students will be collecting data on Barometric pressure and humidity.  When students return, the teacher will explain that students will begin learning about Vex sensors. (15 minutes)  Teacher will show students how to the Vex **limit switch** sensor works using videos and a real life demonstration of the Vex testbed. Then, the teacher will show students how to open ROBOT C++ and develop code for using the limit switch on their Weather Bot. (25 minutes)  **Resources/Links**   * How To Use & Program A Limit Switch -  [https://www.youtube.com/watch?v=M72nK8mXTW0](https://www.youtube.com/watch?v=pZMF5hsfc1M) * Building Guide Limit Switch – <http://tinyurl.com/qxqr3ey>   **Day 4 (Week 1)**  Teacher will explain to students that we are continuing to collect weather data. Students will complete a Do Now/journal entry into the electronic journals on Google Classroom. (5 minutes).  **Do Now**: How can humidity and barometric pressure be used to predict a thunderstorm?  ***DO NOW (Answer):***  Answer to this question can be found as this link: <http://www.livescience.com/39135-incredible-technology-how-to-forecast-severe-storms.html>  **SAY:** After students have completed their Do Now, the teacher will review the behavior expectations for collecting data outside. Students will take about 15 minutes to collect data using their TI sensor.  When students return, the teacher will explain that students will begin learning about Vex sensors. (15 minutes)  Teacher will show students how to the Vex **line follower** sensor works using videos and a real life demonstration of the Vex test bed. Then, the teacher will show students how to open ROBOT C++ and develop code for using the line follower on their Weather Bot. (25 minutes)  **Resources/Links**   * How To Use & Program Line Follower Sensor - <https://www.youtube.com/watch?v=KxGHbnUpcus> * Building Guide Line Follower – <http://tinyurl.com/qcjh3c8>   ***Day 5 (Week 1)***  Teacher will explain to students that will complete collecting data, create graphs and answer reflection questions with their group. Teacher will instruct students to collect Do Now in Google Classroom.  **DO NOW:** What chart types do think you is the best option to display your weather data? Why? (5 minutes)  ***DO NOW (Answer):***  Students should use a bar chart or line chart to represent the data because that are showing trends over a specific amount of time.  **SAY:** Teacher will allow students to finish collecting data for the weather experiment. The teacher will review data collection expectations before students are released outside. They will answer reflections questions and complete graphs with their team data. \*\*Students should choose the correct graph to display their data. They should use either a line or bar chart but teacher should allow students to arrive at this conclusion.(10 minutes)  After students have completed their graph and reflection questions, they will present their information to the class. A rubric will be provided to teams. Teams will provide peer feedback on the rubrics provided using the oral presentation rubric. The peer evaluations will be anonymous. A team for each class will be voted as the “School Name” Meteorologist based on their peer evaluations. (30 minutes)  **Resources/Links**   * Middle School Meteorologist PowerPoint <http://tinyurl.com/qbo5y5p> * Lap Report Rubric - <http://tinyurl.com/q2td7pr> * Collaborative Work Rubric- <http://tinyurl.com/o73fc5v> * Oral Presentation Rubric- <http://tinyurl.com/omyrqys> * Building a Structure Rubric - <http://tinyurl.com/obvnmjv>   Teacher will circulate room and provide assistance as needed.  **Day 1 (Week 2)**  Upon entering the class, the teacher will instruct students to complete Do Now in Google Classroom.  **DO NOW:** How do you think we will attach wheels to our weather robot? (5 minutes)  ***DO NOW (Answer):***  Answers may vary but students mentioned the axle and using a tool to hold the wheels onto the axle.  **SAY:** Teacher will show students the following programming guide. It will show students how to attach a wheel to their robot. <http://tinyurl.com/nsmzg4z>  Teacher will explain to students that today, they will begin creating their Weather Bot. The teacher will explain to students that will need to use the D.E.A.L (engineering design process) to create a robot to predict the weather using sensors they learned about last week. The following steps are included in the engineering design process: (1) define the problem, (2) explore solutions, (3) apply a solution and (4) look back and learn. Teacher should play the engineering rap and explain that the engineering design process is used to ensure that we have a quality product. The students will (1) select the type of weather they would like to explore, (2) perform research on the types of Weather bots already created (3) develop sketches in Google Sketch-Up of their devices, \*or if computers are not available students can sketch their designs on paper (4) vote on the best design, (5) build the weather bot, (6) program the weather bot, (7) test the product, and (8) share their results with the class. There will be a Weather Bot winner for each class.  Teacher will explain that today, the students will focus on selecting the type of weather they would like to predict with their Weather Bot and then perform research on the types of weather bots that are currently available. (35 minutes)  Teacher will walk around and provide guidance as needed.  **Resources/Links**   * Oral Presentation Rubric- <http://tinyurl.com/omyrqys> * D.E.A.L at Neal (Engineering Design Process)- <http://tinyurl.com/qg6xtb9> * Engineering Design Process Rap - <https://www.youtube.com/watch?v=pASRNRlvFVY> * Mind Mapping (X Mind 60) – <http://www.xmind.net/download/win/> *\*\*This software is designed to help students with the ideation process. Before, using this in your classroom, please make sure that it is approved by the tech services department.* * PowerPoint Outline for Weather Bot - <http://tinyurl.com/qgmbzx4> * Vex Inventors Guide - <http://tinyurl.com/nsmzg4z>   **Day 2 (Week 2)**  Upon entering the class, the teacher will instruct students to complete Do Now in Google Classroom.  **DO NOW:** What do you think will be the most difficult aspect of using the engineering design process? (5 minutes)  ***DO NOW (Answer):***  Answers may vary.  Teacher will explain to students that today they will continue working through the engineering design process to design their Weather Bot. The teacher will explain to students that they will need to use the D.E.A.L (engineering design process) to create a robot to predict the weather using sensors they learned about last week. Teacher should play the engineering rap and explain that the engineering design process is used to ensure that we have a quality product.  The students will (1) select the type of weather they would like to explore, (2) perform research on the types of Weather bots already created (3) develop sketches in Google Sketch-Up of their devices, (4) vote on the best design, (5) build the weather bot, (6) program the weather bot, (7) test the product, and (8) share their results with the class. There will be a Weather Bot winner for each class.  Teacher will explain that today, the students will focus on sketching a design for their Weather Bot and selecting the best design. Each member of the team will complete a sketch for the Weather Bot. Students should make sure that motors, sensors and parts are labeled in their sketches. The pseudocode of the Weather Bot should be written on the back of the sketch. This will provide the programmer with a foundation for programming the Weather Bot. Students will use the decision matrix to vote on the best design. This is the design their team will build for the Weather Bot challenge. Teacher will walk around and provide guidance as needed.  **Resources/Links**   * Isometric Graph Paper – <http://www.printablepaper.net/category/isometric_graph> * Decision Matrix - <http://tinyurl.com/pteuqqb>   **Day 3 (Week 2)**  Upon entering the class, the teacher will instruct students to complete Do Now in Google Classroom.  **DO NOW:** What criteria did you use yesterday to select the sketch that your team will build? Why? Do you think you team selected the best sketch? (5 minutes)  ***DO NOW (Answer):***  Answers may vary. Students may mention design, function, layout etc. in their answer.  **SAY:** Teacher will explain to students that today they will continue working through the engineering design process to design their Weather Bot. The teacher will explain to students that they will need to use the D.E.A.L (engineering design process) to create a robot to predict the weather using sensors they learned about last week. The video should be played each day to reinforce the steps in the engineering design process. Teacher should play the engineering rap and explain that the engineering design process is used to ensure that we have a quality product. Teacher will use the “Vex Inventors Guide” to show students how to add wheels to their robots.  The students will (1) select the type of weather they would like to explore, (2) perform research on the types of Weather bots already created (3) develop sketches in Google Sketch-Up of their devices, (4) vote on the best design, (5) build the weather bot, (6) program the weather bot, (7) test the product, and (8) share their results with the class. There will be a Weather Bot winner for each class.  Teacher will explain that today, the building the Weather Bot. Teachers should have a table with all Vex parts displayed so that students may choose what they need. Teacher should assign one or two team members to gather parts from the Vex buffet. \*\*The Vex buffet is about two tables with all the Vex parts on them. Students will go the tables and gather what they need for the Weather Bot. Teacher should also review rules for building and working with their team. The team will build together for the remaining time in the class.  Teacher will walk around and provide guidance as needed.  **Resources/Links**   * Vex Inventors Guide - <http://tinyurl.com/nsmzg4z> * Isometric Graph Paper – <http://www.printablepaper.net/category/isometric_graph> * Decision Matrix - <http://tinyurl.com/pteuqqb>   **Day 4 (Week 2)**  Upon entering the class, the teacher will instruct students to complete Do Now in Google Classroom.  **DO NOW:** Which aspect of this class do you prefer: building or programming? (5 minutes)  ***DO NOW (Answer):***  Answers may vary. Teacher should use this data when break team apart of programming and building.  **SAY:** Teacher will explain to students that today they will continue working through the engineering design process to design their Weather Bot. The teacher will explain to students that they will need to use the D.E.A.L at Neal (engineering design process) to create a robot to predict the weather using sensors they learned about last week. Teacher should play the engineering rap and explain that the engineering design process is used to ensure that we have a quality product. Teacher will explain to students that they will begin programming today. Teams will be split into two groups. One group will program, while the other team members build.  The students will (1) select the type of weather they would like to explore, (2) perform research on the types of Weather bots already created (3) develop sketches in Google Sketch-Up of their devices, (4) vote on the best design, (5) build the weather bot, (6) program the weather bot, (7) test the product, and (8) share their results with the class. There will be a Weather Bot winner for each class.  Teacher will explain that today, the building the Weather Bot. Teacher will work with programmers in a separate area of the classroom. The teacher will provide students with a Vex programming guide and explicit instruction for programming their robot. The teacher will ensure that the proper heading and comments is included in the programming.  Teacher will walk around and provide guidance as needed.  **Resources/Links**   * Vex Inventors Guide - <http://tinyurl.com/nsmzg4z> * Programming Guide - <http://tinyurl.com/pcrkfge> * Isometric Graph Paper – <http://www.printablepaper.net/category/isometric_graph> * Decision Matrix - <http://tinyurl.com/pteuqqb>   **Day 5 (Week 2)**  Upon entering the class, the teacher will instruct students to complete Do Now in Google Classroom.  **DO NOW:** What has been your biggest challenge with building the Weather Bot? How can you fix these problems? (5 minutes)  ***DO NOW (Answer):***  Answers may vary. Teacher should use data to help students maneuver through the engineering design process.  **SAY:** Teacher will explain to students that today they will continue working through the engineering design process to design their Weather Bot. The teacher will explain to students that they will need to use the D.E.A.L (engineering design process) to create a robot to predict the weather using sensors they learned about last week. Teacher should play the engineering rap and explain that the engineering design process is used to ensure that we have a quality product. Teacher will explain to students that they will begin programming today. Teams will be split into two groups. One group will program, while the other team members build.  The students will (1) select the type of weather they would like to explore, (2) perform research on the types of Weather bots already created (3) develop sketches in Google Sketch-Up of their devices, (4) vote on the best design, (5) build the weather bot, (6) program the weather bot, (7) test the product, and (8) share their results with the class. There will be a Weather Bot winner for each class.  Teacher will explain that today, the building and developing programming for the Weather Bot. Teacher will work with programmers in a separate area of the classroom. The teacher will provide students with a Vex programming guide and explicit instruction for programming their robot. The teacher will ensure that the proper heading and comments is included in the programming.  Teacher will walk around and provide guidance as needed.  **Resources/Links**   * Vex Inventors Guide - <http://tinyurl.com/nsmzg4z> * Programming Guide - <http://tinyurl.com/pcrkfge> * Isometric Graph Paper – <http://www.printablepaper.net/category/isometric_graph> * Decision Matrix - <http://tinyurl.com/pteuqqb>   **Days 1-5 (Week 3)**  The teacher will instruct students to get their bins and continue building, programming and testing their Weather Bots. The entire class period will be dedicated to assisting students with troubleshooting and ensuring they have a quality product.  The teacher will remind students that they will present next Friday. She will remind them to monitor their time to ensure they finish.  Teacher will provide students with the Google Slide links so that they may prepare their presentation via Classroom Google. Teacher will encourage students to add pictures and change the slide designs. Students should be aware of their spelling and math in the slides. Once students, finish their PowerPoint they may share the presentation with their teacher by clicking the blue share button in the top right hand corner.  **Resources/Links**   * PowerPoint Outline for Weather Bot - <http://tinyurl.com/qgmbzx4>   ***Days 1-4 (Week 4)***  The teacher will instruct students to get their bins and continue building, programming and testing their Weather Bots. The entire class period will be dedicated to assisting students with troubleshooting and ensuring they have a quality product.  The teacher will remind students that they will present next Friday. She will remind them to monitor their time to ensure they finish.  Teacher will provide students with the Google Slide links so that they may prepare their presentation via Classroom Google. Teacher will encourage students to add pictures and change the slide designs. Students should be aware of their spelling and math in the slides. Once students, finish their PowerPoint they may share the presentation with their teacher by clicking the blue share button in the top right hand corner.  Teacher will review the difference between business casual and business professional to ensure that students are dressed appropriately for their presentation.  **Resources/Links**   * PowerPoint Outline for Weather Bot - <http://tinyurl.com/qgmbzx4> * Business Causal vs Business Professional - <http://www.tarleton.edu/careerservices/Students/dress-to-impress.html>   **On Day 5 of Week 3**, students will present their findings and presentations to the class. Students will conduct peer evaluations and a winner will be chose based on their evaluations. (30 minutes)  The teacher may ask for volunteers or place the number of groups in a cup and pull the presentation order.  Students will be given 10 minutes to review presentation with their team. The winning team will be presented with a novelty check!  **Resources/Links**   * Oral Presentation Rubric- <http://tinyurl.com/omyrqys> * Building a Structure - <http://tinyurl.com/obvnmjv> * PowerPoint Outline for Weather Bot - <http://tinyurl.com/qgmbzx4> |
| **Assessment** | Rubrics will be used for assessing the students in the following areas:   1. Electronic journal entries 2. Developing effective charts/graphs to represent data collected 3. Presenting a product to the class 4. Effective building/creating a product 5. Lap Report Rubric - <http://tinyurl.com/q2td7pr> 6. Collaborative Work Rubric- <http://tinyurl.com/o73fc5v> 7. Oral Presentation Rubric- <http://tinyurl.com/omyrqys> |

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| **Critical Vocabulary** | * **Sensors**    + a device that detects or measures a physical property and records, indicates, or otherwise responds to it * **Bump Switch**   + The bumper switch is a pushbutton that when pressed can cause the robot to respond as programmed. It does this by maintaining a HIGH signal on its sensor port, which means the bumper switch is turned off when not pressed. While the bumper switch is pressed, the signal changes to LOW, which tells the robot that the switch has been triggered on. The bumper switch remains turned on until the button is longer being pressed. <http://www.vexrobotics.com/wiki/Bumper_Switch> * **Potentiomete**r   + A potentiometer is an electrical device whose resistance is adjustable. The user can therefore adjust the degree to which the potentiometer opposes electric current through it, simply by turning a shaft that is attached to the center of the potentiometer. As the resistance of the potentiometer changes, so does the voltage, which thus causes the potentiometer to act as a variable voltage divider. This varying voltage can be measured by the VEX Controller and is directly proportional to the angular position of the shaft connected to the center of the potentiometer. This allows you to obtain an analog measurement of an angular position. The VEX potentiometer is designed with a “D-hole” in the center, which should slide easily over the VEX square shafts. The potentiometer includes two arcs, each ½in from the center hole; these arcs exist to assist with mounting the potentiometer to the robot structure. <http://www.vexrobotics.com/wiki/Potentiometer> * **Line Follower**   + The line tracker enables a robot to autonomously navigate a line-marked path. By drawing a line in front of a robot outfitted with a line tracker, one can dictate the robot’s patch by showing it where to go without using a remote controller. A typical application uses three line trackers, with the middle sensor aligned directly above the intended line. <http://www.vexrobotics.com/wiki/Line_Follower> * **Limit Switch**   + The limit switch sensor is a physical switch. It can tell the robot whether the sensor’s metal arm is being pushed down or not.   **Meteorology –** the act of using various instruments to predict the weather   * Temperature   + is a measure of the air’s hotness or coldness and is the most measured quantity of the atmosphere. * Humidity   + the amount of water vapor in the air * Wind Speed and Wind Direction   + moving air caused by differences in air pressure.  Air moves from an area of higher pressure to an area of lower pressure.  If there were no wind, there wouldn’t be much day-to-day difference in our weather. * Dew Point   + Dew point is the temperature that air would have to be cooled to in order for the air to be saturated with water vapor. * Atmospheric Pressure   + Atmospheric pressure is a measure of the weight of air in atmosphere above us. Air is made up of molecules of elements in gaseous state and minute dust particles.   **Parts**   * Collar Screw   + Design to hold shafts, axles or gears in place * Allen Ranch   + Used to tighten collar screws and nuts & bolts   **Programming**   * Natural Language   + Programming language used in ROBOT C++   + Provide lines of starter code to ensure that students learn how to code * Autonomous   + Works on programming only, has a start/stop button, does a function/skill alone * Pseudocode   + Step by step instructions for how the code should be written |
| **Community Engagement** | * Field Trip to WRAL TV 5 Weather Department * Meteorologist to sit on panel to judge the Weather Bots * Meteorologist to talk with students about the instruments used to predict weather * Dr. Jesse Jur, to serve on the panel for selecting the best robot for each class |
| **Extension Activities** | * Students may display Weather Bot at school STEM Career Fair. * Students may include robots into science fair projects. |

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| **Modifications** | Modifications will be administered as noted by the students IEP. Modifications can include but are not limited to:   * Providing a dictionary for English Language Learners * Extended Time * Small Groups * Separate Settings * Allowing students to work alone on the project |
| **Alternative Assessments** | * .Teacher may ask students to sketch out the Weather Bot instead of actually building the Weather Bot. Students could use isometric graph paper and label parts of the Weather Bot. Students may explain their design but they should still use the presentation outline for the Weather Bot provided in this unit plan. * Teacher may use other options for robotics kit such Lego Mindstorms |
| **References** | * PLTW Automation & Robotics Curriculum (GTT) * Buck Institute for Education: <http://www.bie.org> |
| **Supplemental Information** |  |
| **Comments** | **Classroom Management Tips**   * Plastic bins labeled with part name * Process for distributing/collecting parts   + Assign “part collectors” within teams to reduce the number of students collecting parts * Team expectations   + Teams earn points for exhibiting excellent behavior * Process for monitoring teams while they work   + Constant monitoring by the teacher   + Assign a safety monitor in each group * Ensuring that all parts remain in the classroom   + Perform a quick check or count   + You may have students sign parts in and out |
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