

Cobot Troubleshooting

Direct Instruction

Engage with Customer Support!

Start the Engage section by presenting the students with the lesson challenge. Tell students:

"For this challenge, you will assume the role of Technical Support Specialists at ORA Mechatronics. Area 51 STEAM Lab, an educational outreach facility in an undisclosed location, has purchased several ORA education kits from you and is in dire need of technical support. Can you help troubleshoot their ORAs?"

Have the students spend a few minutes thinking about their customer support experiences and answering the questions in the Engage section of the Student Activity Sheet. Then tell the students:

"Before we can solve this challenge, we need to learn more about supporting robotic arms and the careers related to them!"

Next, show the Lesson 6 video.

Explore Technical Support Specialist Career Connections

Students will do a brief guided virtual scavenger hunt related to Technical Support Specialist Jobs. Individually or in small groups, have them complete the Explore section on the Student Activity Sheet. If students are struggling with the job outlook section, have them go to the [US Department of Labor and Statistics Occupational Outlook Handbook](#). In this tool, you can find information about thousands of jobs. On the Index page, search for your career (Use Ctrl+F on a Windows machine or Chromebook). When you click on the career of your choice, there is a short video about the career as well as several key pieces of information. The careers closest to a Technical Support Specialist appear to fall under the category of Computer Support Specialists.

Explain the Process of Troubleshooting.

Start the Explain section by asking the students, "Have you ever had to troubleshoot a problem before?" Students likely have been involved in some sort of troubleshooting. A student could have set up a new device that didn't function correctly or helped a family member with a new cell phone experiencing issues.

Ask the students, "How did you go about troubleshooting?" Students likely will give a response like, "I just figured it out." When acting as a Technical Support Specialist, there is a lot of 'figuring things out,' but there is also a formalized process to address customer issues. This process is:

Lesson Plan 6: Cobot Troubleshooting

1. **Identify the problem:** Gather information about the issue, such as error messages or customer feedback to define the problem.
2. **Collect information about the problem:** Look for common causes and not-so-common causes.
3. **Test your theory:** Perform tests to isolate one variable at a time and eliminate potential causes.
4. **Establish a plan of action:** Create a plan to resolve the problem and identify potential effects.
5. **Implement the solution:** Implement **one** change at a time and assess the results before trying something else.
6. **Verify full functionality:** Perform a test (or series of tests) to ensure the system is functioning properly.
7. **Document findings:** Document findings, actions, outcomes, and lessons learned.



As a customer support specialist, you want to be thorough in exploring solutions and documenting fixes. If the problem arises again, you or another technical support specialist can quickly look through the notes in the ticketing system to better understand the issue!

Elaborate: Get Me Tech Support! ASAP!

In this challenge, students will receive three different support tickets. They will need to resolve each ticket using the troubleshooting process.

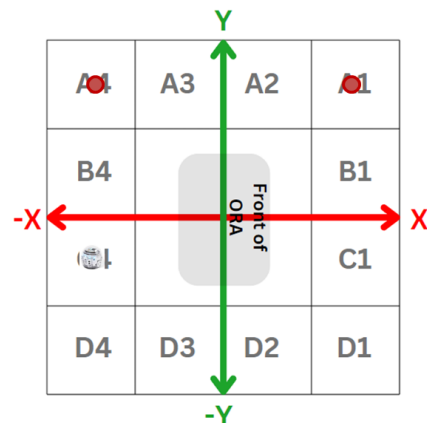
Ticket 1: What is wrong with Evo?

A customer submits a support ticket reporting that their Evo is not connecting to their editor when they click on the "Connect Evo" button in Ozobot Editor. Identify the most likely causes of this connection issue and describe the remedies for the issue.

Lesson Plan 6: Cobot Troubleshooting

Ticket 2: Troubles with ORA Code

A customer submits a support ticket reporting that their ORA is running into errors when performing the code. A customer has submitted the code and setup and would like you to resolve their errors! Refer to the comments for each function to understand what each part should do!



Setup and [Code](#):

Place a wooden cylinder, on end, on A1, center.

Place a wooden cylinder, on end, on A4, center.

Place Evo on C4, center.

Ticket 3: Logic Problems?

A customer submits a support ticket and has submitted a screenshot of the code in question. (Below)

Ticket 3 [Code Snapshot](#)

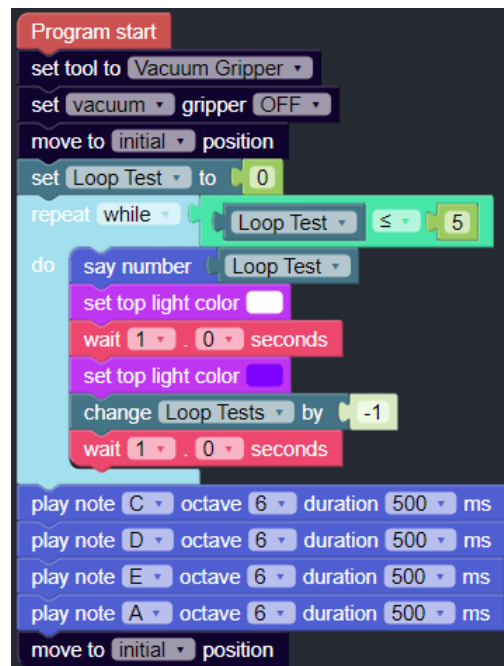
The customer is trying to get the code to perform a loop and then move on to the music, but the code stays in the loop and never leaves.

What suggestions can you give the customer to ensure their code is successful?

Direct students to the Elaborate section of their Student Activity Sheet. Tickets 1 and 3 can be addressed only on paper. Ticket 2 will need access to the ORA with the setup found in quadrant 2 (have students set up the quadrant map themselves). Have student groups rotate out to address ticket 2 with the ORA. If you are comfortable, have them work on your connected device. It is recommended that you are near the ORA to supervise, so if students are stuck/have a question on Ticket 1 or 2, they will need to come to you. Remember to follow the Safety Protocol established in ORA Essentials.

If students are waiting for the ORA, they could:

- Complete the Evaluate section of the Activity Sheets as an exit ticket.



Lesson Plan 6: Cobot Troubleshooting

Elaborate: Example solution

1. Setup

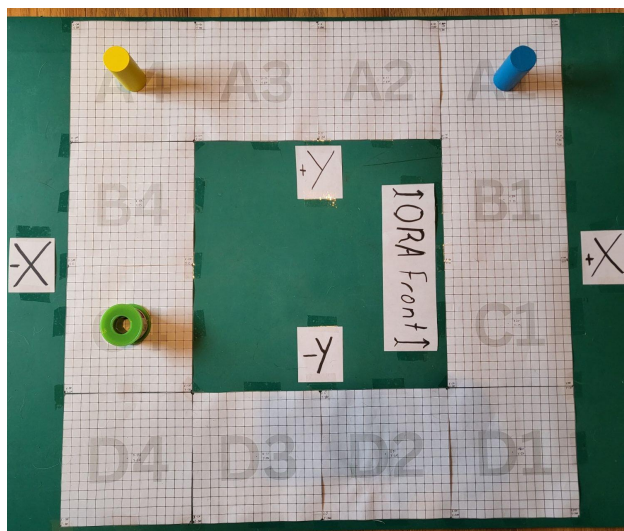
- At right is an image of the setup for the lesson challenge. Note: Evo is represented by a green spool of similar size.

2. Designed Materials

- For this challenge, no additional materials need to be created.

3. Sample Code

- [Example Solution Code](#)



4. Code Description

- In part 1, the code runs into errors due to the end tool trying to move from A4 to D1 in a linear path. This path moves the end tool through ORA's base. This is resolved by changing the movement type from linear to joint.
- In part 2, the very first code block has a z-height value of 10, which will cause the end tool to collide with the block (which has a z-height of 60mm). Once the proper z value is used, the second half of part 2 (movement blocks 3 and 4 of the function) also have low z-heights for their movements. Instead of stacking the cylinders, the cylinder in A4 is knocked over. The z-height values in blocks 3 and 4 need to be increased to resolve the error.
- In part 3, the first issue is that ORA is moving to pick up Evo. But instead of moving to C4, ORA is trying to pick up Evo from B1. Once the coordinates are resolved, the second half of part 3 moves Evo to D1 instead of D2. These coordinates need to be addressed to move Evo to the proper coordinates.

Evaluate: Exit Ticket

Students will fill out and submit the Evaluate Section of the Activity sheets as an exit ticket.

Optional Extension: Setup and Testing Functionality of ORA/Evo Kit

In this activity, another customer has submitted a fourth ticket and has sent in their ORA kit for evaluation. Students will receive ORA and all accessories. ORA will already be set up when the students evaluate it. Students will create a checklist for ORA and Evo, which includes performing the initial setup and running through a series of tests to check functionality. Tests will be performed, and the students will record the results. The evaluation log and the checklist will be included with the return shipment.

Setup: ORA (with vacuum gripper end tool) and Evo will already be set up with the quadrant mat.

Task Requirements:

1. Students must create a 'troubleshooting and evaluation log' to detail all actions taken by the technical support specialist.
2. Students must create a checklist including:
 - a. Connecting the computer to the ORA
 - b. Connecting to the Evo
 - c. A basic test (and code) to evaluate the functionality of the robotic arm
 - d. A basic test (and code) to evaluate the functionality of the vacuum gripper end tool
 - e. A basic test (and code) to evaluate the functionality of the Evo
3. Run each code and evaluate whether or not ORA and Evo pass or fail.
4. If the robots pass all tests students will provide a copy of the checklist with code and the troubleshooting and evaluation log for the customer.
5. If the robots fail any of the tests, perform further troubleshooting to diagnose and remedy the problem.

