# 2019 Guiding Questions for the SRC Engineering Design E-Portfolio

Directions: Each student team should use the following questions to guide the design of the Robotics Engineering Design E-Portfolio. The guiding questions below reflect various concepts that must be explored and investigated in each step of the design process.

Scenario:

You are working for a local port operator and your job is to manage the movement of cargo containers between cargo ships, trucks and freight trains. Many of the ports around the world have incorporated RFID stickers and automated machines to increase efficiency. Your company wants to incorporate robots and barcode scanners in an effort to improve efficiency at their port. You must design a robot that can move cargo containers between cargo ships, trucks and freight trains in a fast and efficient manner.
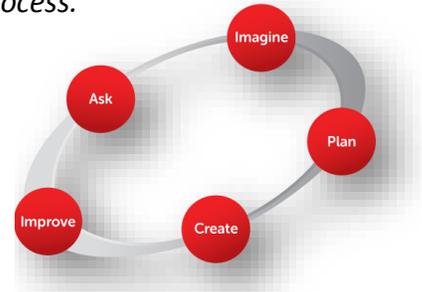
STEP 1: Ask (Write a Detailed Problem Statement)
- What is the problem?

STEP 2: Imagine (Do your research, brainstorm possible solutions, analyze ideas)
- Research Maritime Career Pathways
    - What are the 4 Maritime Career Categories?
    - Which maritime career category does this year's robotics challenge highlight?
    - What career paths do colleges have in the Maritime Industry?
    - What are some pros and cons of automating ports?
    - How can education help ensure that you do not end up in a career that is threatened by automation?
- Research Radio Frequency Identification (RFID):
    - How does RFID Technology work? Please provide a few examples.
    - Why did the Port of Virginia switch from TWIC badge-based identification to PRO-PASS RFID identification as the preferred method used to identify individual trucks?
- Research Barcode Technology:
    - What is symbology?
    - Name some industrial uses of barcodes?
    - Is a barcode better than RFID? Why? Why not?

STEP 3: Plan (Design your solution to the problem identified in Step 1)
- What are the most important design requirements for your robot?
- Draw a diagram?
- Make a list of materials that you will need.

STEP 4: Create (Develop your solution to the problem)
- Describe how your team developed its robot prototype.
- Describe the lessons you learned while programming and building your working robot.
- Describe the procedure your team used to test the robot prototype.
- What data did you collect? Why is the data important?

STEP 5: Improve (Evaluate your solution)
- What works? What doesn't?
- What could work better?
- How will your team use the data collected to improve the prototype?
- Modify your design and write a reflection on the final product.