SCIENTISTS
ASK QUESTIONS
ENGINEERS
DEFINE PROBLEMS

SCIENTISTS + ENGINEERS
WORK AS A TEAM

SCIENTISTS
EXPERIMENT
ENGINEERS
TEST THEIR DESIGN

HOW TO BE A STEM SUPERSTAR!

Follow these steps to explore an issue in your community.

CHECK IT OUT! Here's how teens are using two popular STEM processes—**scientific inquiry** and **engineering design**—to improve people's lives:

- **Building and testing** a "smart shower tracker" that saves water by alerting you when you've showered for too long
- **Researching and testing** ways that local firefighters can reduce their exposure to cancer-causing chemicals by washing their uniforms more often
- **Conducting soil experiments** to help farmers keep more carbon in the soil, which reduces carbon in the atmosphere

Ready to innovate?

LET'S GO!

SCIENTISTS
+ ENGINEERS
ANALYZE DATA

SCIENTISTS
CONSTRUCT EXPLANATIONS
ENGINEERS
DESIGN SOLUTIONS

SCHOLASTIC

NO FEE OR PURCHASE NECESSARY TO ENTER OR WIN. Void where prohibited. The Competition is open only to full-time high school students in a public, private, or home school that is in compliance with the laws and regulations of its state/district and who are residents of the above. A Complete team of three to four students and a Team Advisor must be registered by January 3, 2023, at 11:59 p.m. ET. Mission Folders the complete competition entry) may only be submitted electronically by the Team Advisor by February 1, 2023, at 11:59 p.m. ET. See Official Rules for full entry and prizing information. Prizes: Each student on the first-place national winning teams will receive up to $10,000 of deserving schools. State, regional, and honorable mention team prizes will also be awarded. SPONSOR: NSTA AEOP, 1840 Wilson Boulevard, Arlington, VA 22201-3092 USA

aeop | Cybermission ACCEPT THE CHALLENGE

TEACHER RESOURCE SHEET

GETTING STARTED WITH eCYBERMISSION!

Encourage students to use STEM to explore or solve a community issue. Here's everything you need to guide them through the process.

ABOUT THE COMPETITION

With the support of a Team Advisor, students in grades 6–9 work in teams of 3 or 4 to either:

- **ASK** a question and construct an explanation by designing an experiment (scientific inquiry) OR
- **DEFINE** a problem and design a prototype/model (engineering)

COMPETITION STEPS

Find these sheets in this guide.

PLAN THE PROJECT

- ❑ Work as a Team
- ❑ Ready, Set, Brainstorm
- ❑ Create a Problem Statement

SCIENTIFIC INQUIRY

- ❑ Develop Your Hypothesis

ENGINEERING DESIGN

- ❑ Plan Your Design

IMPLEMENT THE PROJECT

*Find these sheets at **scholastic.com/eCYBERMISSION***

- ❑ Conduct a Safety Check

SCIENTIFIC INQUIRY

- ❑ Design Your Experiment
- ❑ Analyze Your Data
- ❑ Find Sources of Error
- ❑ Draw Conclusions

ENGINEERING DESIGN

- ❑ Build Your Vision
- ❑ Test, Analyze, Improve
- ❑ Find Sources of Error

FINALIZE THE MISSION FOLDER

- ❑ Wrap It Up

TOOLS TO DEVELOP ENTRIES

Use the activity sheets in this guide and online at **scholastic.com/eCYBERMISSION** to support teams at each stage of the process. **TIP:** Make sure teams save all notes and charts!

FOR MORE RESOURCES

Visit **eCYBERMISSION.com** to access competition rules, grading rubrics, and other important Team Advisor and student resources.

REMOTE TIP Check out CyberGuide Live Chats at **eCYBERMISSION.com/CyberGuideChat** for live team support.

DEADLINE
Teams must complete their Mission Folders at **eCYBERMISSION .com** by **3/3/2021**.

ORGANIZE YOUR MISSION!

Join eCYBERMISSION, a competition that challenges young people like you to explore issues in your community using science and engineering.

GREAT PRIZES!
You could win up to $10,000 in savings bonds!
Deadline: 3/3/21

GET STARTED

You'll need a team of 3 or 4 students in the same grade, PLUS a Team Advisor (like a teacher or parent). Then your team will:

- ★ Ask a question and construct an explanation by designing an experiment, OR
- ★ Define a problem and design a prototype

DEVELOP YOUR ENTRY

Your teacher will give you activity sheets to help your team participate in the competition. You'll:

- Build your team and brainstorm a topic
- Create a hypothesis or design statement
- Design an experiment or test a prototype
- Analyze your data and draw conclusions

TIP: Keep all your notes and charts. You'll need them to submit your Mission Folder.

COMPLETE AND SUBMIT!

Finally, you'll complete a Mission Folder, which will become your competition entry!
The deadline is March 3, 2021.

- If you design an experiment, submit answers to the Scientific Inquiry Questions (bit.ly/SIquestions)
- If you build a prototype/model, submit answers to the Engineering Design Process Questions (bit.ly/EDPquestions)

AMAZING PRIZES

Each student on a prize-winning team will receive a savings bond! Prizes include:

- National Awards: **$10,000** savings bond at maturity
- Regional Winner: **$4,000** savings bond at maturity
- Regional Finalist: **$2,000** savings bond at maturity
- State 1st Place: **$1,000** savings bond at maturity
- State 2nd Place: **$500** savings bond at maturity

Name _____

WORK AS A TEAM

The key to a successful project is teamwork! Get ready for the **eCYBERMISSION** by responding to the scenarios below, then create your own team plan.

PART A: Read and Analyze

▶ **SCENARIO 1:** Paulo, Kayla, and Ben are collaborating on their project. They decide that Paulo will take meeting notes, Kayla will be the meeting leader, and Ben will gather the materials they need. Through their discussions, they discover that Kayla is a good artist, Ben is a computer whiz, and Paulo is comfortable making presentations in class. They use these strengths to assign tasks in their group.

1. How is the team demonstrating teamwork?

2. What strengths do the people on your team have?

▶ **SCENARIO 2:** Britney, Jamaal, and Lucia have been working together for several weeks and have set deadlines for each team member to meet. But Lucia has a cold and doesn't feel well enough to finish her tasks this week. She texts Britney and Jamaal to let them know, and the three team members make a plan for dividing up her work.

1. How is the team demonstrating teamwork?

2. What would you do if your team faced this problem?

▶ **SCENARIO 3:** Tasha, Xavier, and Anthony are planning their project. Tasha and Xavier agree on the topic, but Anthony wants to investigate something else. The three team members argue until Anthony gives in. Tasha and Xavier schedule their next meeting without telling Anthony.

1. How could the team handle this situation differently to promote teamwork?

2. What would you do if your team faced this problem?

PART B: Your Turn

On a separate sheet, develop and write a team working agreement. Make sure to include:

- How your team will share responsibilities
- How your team will communicate
- How your team will handle any problems that arise

Name _____

READY, SET, BRAINSTORM

The first step in developing your Mission Folder for the competition is to come up with possible topics as a team, then do research.

PART A: Brainstorm

What area will your team focus on? Circle one.

Alternative Sources of Energy **Environment**

Food, Health & Fitness **Forces & Motion**

National Security & Safety **Robotics** **Technology**

Now consider how it affects your community. On a separate sheet of paper, write down as many problems as you can think of that are related to your chosen subject.

Finally, circle the three problems that you are most interested in exploring.

MEET THE GREEN TEAM! A team of three middle school students are entering the eCYBERMISSION competition. They're focusing on environmental issues in their town, so they named themselves the **Green Team**. They brainstorm a big list of issues, then each team member chooses one to research: Quan selects flood prevention, Aaliyah picks reducing water pollution, and Matt picks air quality.

PART B: Research

Have each group member choose one issue to research. Create a chart like this one to record your answers.

PROMPT	NOTES	SOURCE
What is the issue?		
Who is affected by this issue?		
Where can you observe this issue?		
When did it start?		
Why is this issue important?		
How have people tried to address this issue?		

Name _____

CREATE A PROBLEM STATEMENT

The next section of the Mission Folder is called the Problem Statement section. If you choose the **scientific inquiry** path, your team will develop a question you hope to answer. If you select the **engineering design** path, your team will identify a specific problem you hope to solve.

PART A: Choose Your Focus

1. What is the **issue** we chose? _____

2. What specific **topic within that issue** will we focus our project on?

_____

PART B: Research

Conduct research to learn more about your problem and how people have tried to address it before. Take notes on **innovations** that engineers have tried or **experiments** that scientists have conducted. Compile a list of at least 10 different sources from your research. Sources include books, periodicals (magazines and journals), websites, and experts.

PART C: Choose Your Path

Now that you know more about your topic, which path will you choose for your project?

- ❑ **Scientific inquiry** (conducting experiments)
- ❑ **Engineering design** (building a prototype or model)

PART D: Ask Your Question or Identify Your Problem

- ★ For **scientific inquiry,** you should establish the **question** your team hopes to answer through investigation.
- ★ For **engineering design,** you should state the specific **problem** your team hopes to solve through engineering.

Some ideas to get you started:

- ★ For **scientific inquiry:** What are the effects of...? Which type of...? (Consider words like "prevent," "identify," "analyze"...)
- ★ For **engineering design:** We want to reduce... (Consider words like "construct," "design," "prototype," "model"...)

SEE IT IN ACTION The Green Team selects water pollution as their topic. They decide to pursue the *scientific inquiry* path and narrow their question to: Which type of herbicide will be most effective in controlling weeds while also reducing the level of harmful chemicals in the local water supply? Another team, the Food Waste Warriors, decides to develop an *engineering design* project. They define this problem: We want to address the problem of food waste and illness due to spoiled food.

OUR QUESTION OR OUR PROBLEM TO SOLVE:

_____

_____

Name _____

DEVELOP YOUR HYPOTHESIS

Ready to dive into scientific inquiry? It's time to develop a hypothesis, or a prediction statement that you will test.

PART A: Read and Analyze

1. An **independent variable** is what **you** change during an experiment. (Always test only one independent variable at a time.) What is the Green Team's independent variable?

_____

2. A **dependent variable** is what changes **as a result** of changing the independent variable. What is the dependent variable in the Green Team's hypothesis?

_____

3. A **hypothesis** must be able to be tested. Can the Green Team's hypothesis be tested? Why or why not?

_____

_____

_____

_____

SEE IT IN ACTION After conducting research on different solutions to water pollution caused by the toxic runoff of herbicides, Quan, Aaliyah, and Matt decide on a hypothesis: *If we use a vinegar-based herbicide, it will kill weeds equally and as effectively as a conventional herbicide.*

PART B: Write a Hypothesis for Your Project

QUESTION	RESPONSE
Independent Variable: What are we changing?	
Dependent Variable: What are we expecting to change as a result?	
Hypothesis: What is our prediction? If _____ (we do this), then _____ (this will happen).	

Name _____

CONDUCT A SAFETY CHECK

Before you start your experiment, be sure you're following the competition and safety guidelines. Then review this list again before you submit your project.

PART A: RULES

1. Have you reviewed the eCYBERMISSION Rules and Guidelines (bit.ly/eCYBRules)? What questions do you have?

_____

_____

PART B: SAFETY

2. Did you work with your Team Advisor to identify possible risks in your project and complete the Risk Assessment Form (bit.ly/eCYBRisk)?

3. Does your project involve any hazardous:

❑ Chemicals? _____ ❑ Activities? _____

❑ Devices? _____ ❑ Biological agents? _____

4. Describe the safety precautions you will follow while working on your project.

_____

_____

PART C: ETHICS

If your project involves humans (including if you conduct a survey) or animals, you'll need to have the risk evaluated by a committee called an Institutional Review Board (IRB).

5. Does your project involve testing humans (including conducting a survey)? _____

6. Does your project involve testing animals? _____

7. If yes, do you have IRB approval for your project (bit.ly/eCYBIRB)? _____

Name _____

DESIGN YOUR EXPERIMENT

To continue your **scientific inquiry**, test your hypothesis by designing and conducting an experiment.

PART A: Read and Analyze

1. Read the Green Team's approach on the right. Why does the Green Team apply each herbicide to 3 trays instead of just 1?

_____

2. A **control** is a group that receives "normal" treatment during an experiment. What is the control in the Green Team's experiment? Why do experiments need a control?

_____

3. A **constant** is what you keep the same in an experiment. What are the constants in the Green Team's experiment?

_____

4. What is the Green Team's plan for data collection?

_____

SEE IT IN ACTION To test whether a vinegar-based herbicide will kill weeds as effectively as a conventional herbicide, the Green Team has decided to plant nine identical trays of crabgrass. They will use a vinegar-based herbicide on three trays and a conventional herbicide on three trays, making sure to use safety gear. They will not put any herbicide on the last three trays. They will use the same amount of soil for all trays and give all the crabgrass the same amount of sun and water daily. Then they'll measure the crabgrass weekly and record their findings.

PART B: Plan

Now work with your team to justify the procedures for your own experiment. Copy the following chart on a separate sheet and fill it in. Be as **specific** as possible.

- ❑ Include a plan for collecting your data and making sure your results are reliable.
- ❑ Make sure to include any safety precautions.

STEP	WHY IS THIS STEP NEEDED?
Step 1:	
Step 2:	
(Add more rows as needed.)	

PART C: Test

Test your hypothesis by conducting your experiment. Record your data in a table. (Refer to Activity 7: Analyze Your Data for an example data table.)

Name _____

ANALYZE YOUR DATA

After your investigation, it's time to look at the results. Practice by analyzing some of the Green Team's data.

PART A: Read and Analyze

CRABGRASS GROWTH	TRAY 1 (CONVENTIONAL HERBICIDE)	TRAY 2 (VINEGAR-BASED HERBICIDE)	TRAY 3 (NO HERBICIDE)
Week 1	1.2 mm	4.5 mm	5.0 mm
Week 2	1.0 mm	3.8 mm	4.9 mm
Week 3	1.4 mm	4.3 mm	5.0 mm

1. Find the **central tendency** (also known as the **mean**, **median**, and **mode**) of the weekly growth measurements for each tray.

2. Which plant grew the most during Week 1? How do you know?

3. Do you notice a pattern between the independent variable (type of herbicide) and the dependent variable (growth of weeds)? Describe it.

▶ **MEAN:** This is the average. To calculate, add all measurements, then divide by how many measurements there are.

▶ **MEDIAN:** This is the middle value when the measurements are put in order from smallest to largest.

▶ **MODE:** This is the value that appears most often in a data set.

PART B: Your Turn—Collect and Analyze Data

1. What will you need to observe and measure as you test your hypothesis?

_____

2. Create a chart like the one below to record your data from each trial.

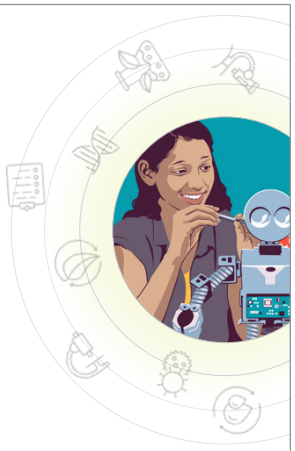
	TRIAL 1	TRIAL 2	TRIAL 3
Measurement 1			
Measurement 2			

3. Using your own experiment, find the measures of central tendency and look for patterns.

4. Circle the visual representation that will work best with your data. Now create it!

bar chart **line chart** **diagram** **infographic** **other:** _____

Name _____



FIND SOURCES OF ERROR

Every **scientific inquiry** experiment has errors—but this isn't the same as making a mistake! Learn the most common types here.

PART A: Read and Respond

TYPE OF ERROR	CHARACTERISTICS	EXAMPLES
Systematic Error	★ Predictable (repeated) ★ Affects how accurate a measurement is (accurate = how close it is to the real value?)	★ Instrument is old or not calibrated ★ You only survey a very small group of people
Random Error	★ Not predictable ★ Affects how precise a measurement is (precise = same result with multiple measurements)	★ A reading on a scale fluctuates ★ You estimate a measurement when it falls between two markings on an instrument

Now help the Green Team figure out the source of their errors:

1. When Aaliyah is measuring a plant, she notices the height falls between the 4.1 cm mark and the 4.2 cm mark on her ruler. What type of error does this cause? _____

2. When Quan is measuring a plant, he notices that the markings on the end of the ruler he is using have worn away. What type of error does this cause? _____

3. When Matt is measuring a plant, he notices that the soil has shifted, affecting the height of the plant. What type of error does this cause? _____

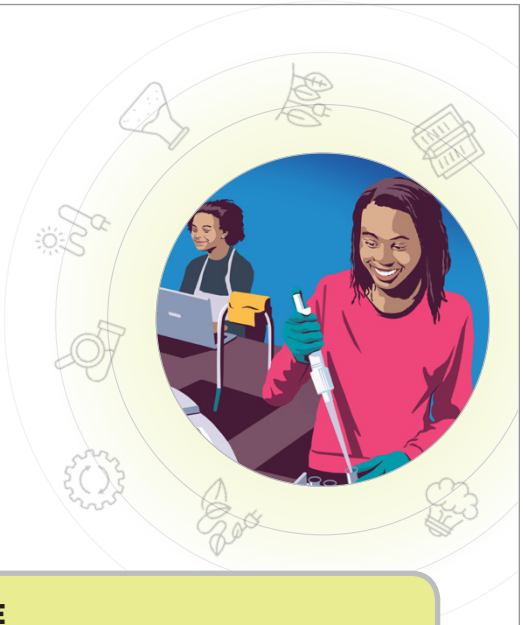
PART B: Your Turn—Check Your Project

Summarize your project's errors on this chart.

TYPE OF ERROR	EXAMPLES IN OUR PROJECT
Systematic Error	
Random Error	

Name _____

DRAW CONCLUSIONS



Almost done! In the final step, connect the dots by analyzing your results.

Draw Conclusions

Now work with your team to draw conclusions from your experiment or model. Copy the chart below on a blank sheet of paper and fill it in. Then, turn your answers into paragraph form.

QUESTIONS FOR SCIENTIFIC INQUIRY	RESPONSE
Did your experiment support or refute your hypothesis? Why?	
What is the relationship between the independent variable and the dependent variable?	
What evidence do you have to support your conclusions?	
Were your results reliable?	
What changes would you make to your experiment in the future?	

QUESTIONS FOR ENGINEERING DESIGN	RESPONSE
Did your testing display that your design fits within your criteria and constraints? Why?	
Does your design solve the problem stated in your problem statement? Why or why not?	
What evidence do you have to support your conclusions?	
Were your results reliable?	
What changes would you make to your design to improve it?	

Name _____

WORK AS A TEAM

The key to a successful project is teamwork! Get ready for the **eCYBERMISSION** by responding to the scenarios below, then create your own team plan.

PART A: Read and Analyze

▶ **SCENARIO 1:** Paulo, Kayla, and Ben are collaborating on their project. They decide that Paulo will take meeting notes, Kayla will be the meeting leader, and Ben will gather the materials they need. Through their discussions, they discover that Kayla is a good artist, Ben is a computer whiz, and Paulo is comfortable making presentations in class. They use these strengths to assign tasks in their group.

1. How is the team demonstrating teamwork?

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- How your team will communicate
- How your team will handle any problems that arise

Name _____

READY, SET, BRAINSTORM

The first step in developing your Mission Folder for the competition is to come up with possible topics as a team, then do research.

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What area will your team focus on? Circle one.

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Food, Health & Fitness **Forces & Motion**

National Security & Safety **Robotics** **Technology**

Now consider how it affects your community. On a separate sheet of paper, write down as many problems as you can think of that are related to your chosen subject.

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PROMPT	NOTES	SOURCE
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When did it start?		
Why is this issue important?		
How have people tried to address this issue?		

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2. What specific **topic within that issue** will we focus our project on?

_____

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Conduct research to learn more about your problem and how people have tried to address it before. Take notes on **innovations** that engineers have tried or **experiments** that scientists have conducted. Compile a list of at least 10 different sources from your research. Sources include books, periodicals (magazines and journals), websites, and experts.

PART C: Choose Your Path

Now that you know more about your topic, which path will you choose for your project?

- ❑ **Scientific inquiry** (conducting experiments)
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PART D: Ask Your Question or Identify Your Problem

- ★ For **scientific inquiry,** you should establish the **question** your team hopes to answer through investigation.
- ★ For **engineering design,** you should state the specific **problem** your team hopes to solve through engineering.

Some ideas to get you started:

- ★ For **scientific inquiry:** What are the effects of...? Which type of...? (Consider words like "prevent," "identify," "analyze"...)
- ★ For **engineering design:** We want to reduce... (Consider words like "construct," "design," "prototype," "model"...)

SEE IT IN ACTION The Green Team selects water pollution as their topic. They decide to pursue the *scientific inquiry* path and narrow their question to: Which type of herbicide will be most effective in controlling weeds while also reducing the level of harmful chemicals in the local water supply? Another team, the Food Waste Warriors, decides to develop an *engineering design* project. They define this problem: We want to address the problem of food waste and illness due to spoiled food.

OUR QUESTION OR OUR PROBLEM TO SOLVE:

_____

_____

Name _____

PLAN YOUR DESIGN

Ready to continue the **engineering design process**? It's time to create a prototype, or working model, of your solution.

PART A: Design a Prototype

1. What **criteria** (requirements) does your solution need to meet to be successful?
2. What **constraints** (limitations) do you have?
3. As a team, brainstorm prototype ideas. Be specific about how each one would work. Then copy and complete the below chart to decide whether each idea meets your criteria and constraints.

	MEETS REQUIREMENT 1	MEETS REQUIREMENT 2	MEETS REQUIREMENT 3
Prototype Idea 1			
Prototype Idea 2			

Now choose the prototype idea that best meets your team's requirements.

PART B: Prepare to Build

1. **Sketch a diagram** of your team's design and discuss how it will function. Label each part carefully.
2. **Identify all of the materials** you will need to build a working model of your solution. Don't forget to list any tools you will use.

TIP: Remember that the engineering design process is a cycle—you'll be able to revise your design after you start building!

MEET THE FOOD WASTE WARRIORS! For their eCYBERMISSION entry, Richie, Deja, and Monica are building a device that will alert people when food is about to spoil. They brainstorm a few ideas for how to build their prototype using different materials and approaches. Then they compare their ideas with their requirements list (criteria for success as well as constraints). One prototype idea meets all the requirements, so they get to work sketching it and gathering their materials.

Name _____

CONDUCT A SAFETY CHECK

Before you start your experiment, be sure you're following the competition and safety guidelines. Then review this list again before you submit your project.

PART A: RULES

1. Have you reviewed the eCYBERMISSION Rules and Guidelines (bit.ly/eCYBRules)? What questions do you have?

_____

_____

PART B: SAFETY

2. Did you work with your Team Advisor to identify possible risks in your project and complete the Risk Assessment Form (bit.ly/eCYBRisk)?

3. Does your project involve any hazardous:

❑ Chemicals? _____ ❑ Activities? _____

❑ Devices? _____ ❑ Biological agents? _____

4. Describe the safety precautions you will follow while working on your project.

_____

_____

PART C: ETHICS

If your project involves humans (including if you conduct a survey) or animals, you'll need to have the risk evaluated by a committee called an Institutional Review Board (IRB).

5. Does your project involve testing humans (including conducting a survey)? _____

6. Does your project involve testing animals? _____

7. If yes, do you have IRB approval for your project (bit.ly/eCYBIRB)? _____

Name _____

BUILD YOUR VISION

The next step in the **engineering design process** is to create your prototype and make revisions to your design.

PART A: Build

1. Use your design to build your prototype. As part of the process, make any necessary adjustments to the design.

2. As you build your prototype, write down the steps you take.

3. Did you make any adjustments to your original plan while building? Why or why not?

_____

_____

4. What safety precautions did you follow while building your prototype?

_____

_____

SEE IT IN ACTION The Food Waste Warriors make a safety plan, then start building a working model of a sensor that alerts people when fresh food is about to go bad. They follow their diagram, but some of the parts don't fit, so they make adjustments along the way. Then they make a plan to test the sensor to make sure it will work with different foods and in different refrigerators.

PART B: Prepare to Test

Write the procedures for testing your prototype on a separate sheet of paper. Be specific, so that someone else could follow your instructions. Make sure to:

- ❑ Include a plan for collecting your data and making sure your results are reliable.
- ❑ Include any safety precautions.

★ Remember that the engineering design process is a cycle—you may want to repeat some of the steps as you improve your design!

Name _____

TEST, ANALYZE, IMPROVE

Continue the **engineering design process** by testing, then dive into the data.

PART A: Test and Collect Data

1. What will you need to measure as you test your solution?

_____

2. What other observations will you need to record?

_____

3. Create a chart like the one below to record your data from each trial.

SEE IT IN ACTION The Food Waste Warriors use their device to measure the amounts of moisture and chemicals released by food that is about to spoil. They test the device in multiple *trials* and record the measurements in a data table. They find that their device was reliable at detecting fruit that was about to go bad, but not meat.

	TRIAL 1	TRIAL 2	TRIAL 3
Measurement 1			
Measurement 2			

4. Now test your prototype! Be sure to test it in as many situations as you can think of.

PART B: Analyze and Draw Conclusions

1. Which visual representation will work best with your data? Create it!

bar chart **line chart** **diagram**

infographic **other:** _____

2. Based on your tests, did your design address the problem you set out to improve?

_____

3. Was there an issue with a part of the design or the entire design? Which part?

_____

4. What improvements will you make to your design before you test again?

_____

Name _____

FIND SOURCES OF ERROR

Every engineering design model has errors—but this isn't the same as making a mistake! Learn the common types here.

PART A

Review the chart below, then respond to the questions.

TYPE OF ERROR	CHARACTERISTICS	EXAMPLES
Systematic Error	★ Predictable (repeated) ★ Affects how accurate a measurement is (accurate = how close it is to the real value?)	★ Instrument is old or not calibrated ★ You only survey a very small group of people
Random Error	★ Not predictable ★ Affects how precise a measurement is (precise = same result with multiple measurements)	★ A reading on a scale fluctuates ★ You estimate a measurement when it falls between two markings on an instrument

1. After the first set of trials, Richie realizes that the moisture sensor is not calibrated correctly. All of the readings are 1% higher than they should be. What type of error is this? _____

2. When Deja is testing the device, she notices that the reading for the level of a chemical fluctuates between two quantities. What type of error is this? _____

3. When Monica is testing the device, she accidentally knocks one of the wires out of place so the device's alarm does not sound. What type of error is this? _____

PART B

Copy this chart on a separate sheet and fill it out to summarize the sources of error in your project.

TYPE OF ERROR	EXAMPLES IN OUR PROJECT
Systematic Error	
Random Error	

Name _____

WRAP IT UP

Now that you're finished, it's time to explain how your solution will help your community—and complete your Mission Folder to enter the competition.

PART A: The Last Step

What Is the Community Impact? ➡ Your audience will want to know how your findings or innovation help people. Use these prompts to brainstorm your message.

PROMPT	NOTES
Who would use your findings or innovation (families, students, small business owners, etc.)?	
How will your findings or innovation help the community?	
Is anyone in the community left out of your findings or innovation? What can you do about this?	

PART B: Ready to Submit!

Mission Folder Questions ➡ Scientists and engineers share their findings in many ways—through articles, posters, reports, and social media. Your team will communicate your results by submitting your Mission Folder.

Use your notes and charts to make sure that your team responds to all the Mission Folder questions.

- ★ If you design an experiment, use the Scientific Inquiry questions **(bit.ly/SIquestions)**
- ★ If you build a prototype/model, use the Engineering Design Process questions **(bit.ly/EDPquestions)**

MISSION FOLDER CHECKLIST

- ❑ Our explanations are clear and complete. Someone who was not involved in our project can understand them.
- ❑ We have used visuals to help our audience understand our project. For example, we included labeled diagrams, graphs, and/or charts.
- ❑ We connected our project to the original problem facing our community.
- ❑ We used the correct scientific terms when describing our process and results.
- ❑ We checked our spelling and grammar to make sure our responses are polished and easy to understand.