forward EDUCATION

Climate Action Kit
Design Journal

Name: _____

YOUR TASK

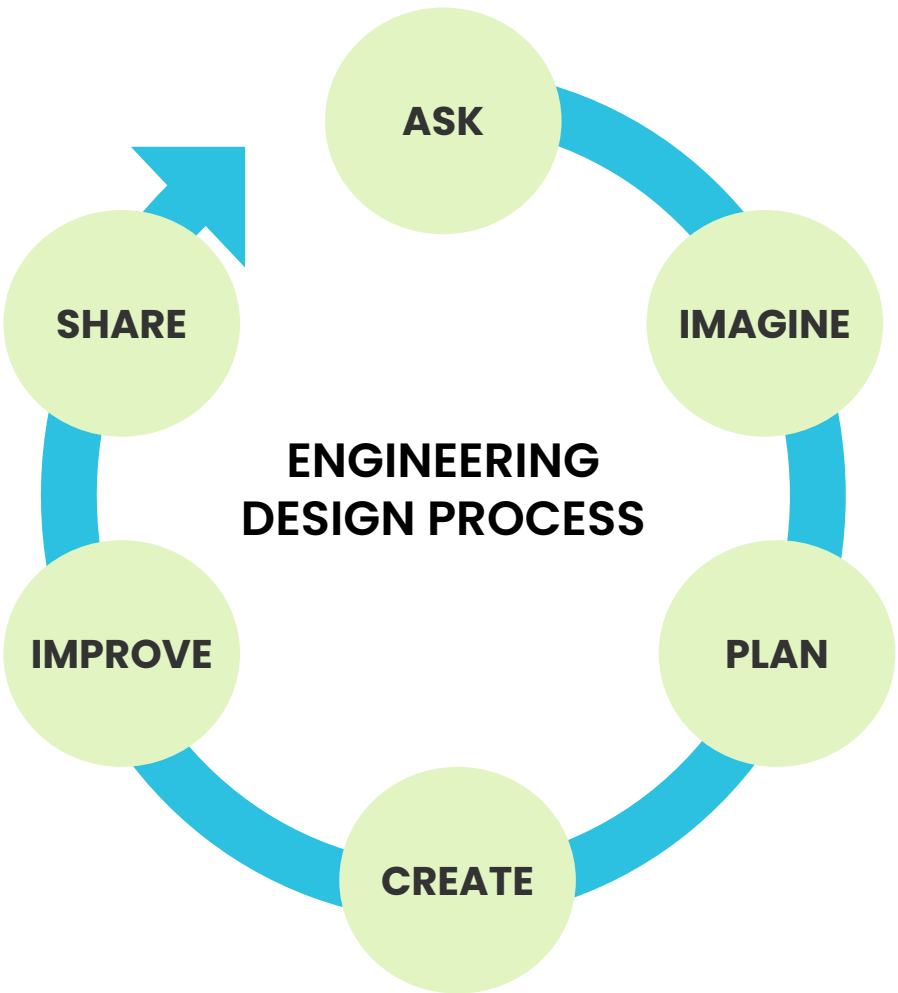
Follow the Engineering Design Process while using the Climate Action Kit to address one of the United Nations' Sustainable Development Goals.

Engineering Design Process

The Engineering Design Process is a way to solve problems step-by-step. It helps you think carefully, ask good questions, and come up with creative ideas.

The Stages of the Engineering Design Process

1. **Ask** what the problem is and research to learn more about it!
2. **Imagine** different creative ways to solve the problem.
3. **Plan** your best idea and get ready to build it.
4. **Create** a prototype or model of your idea.
5. **Improve** on your prototype by testing it out in many different conditions.
6. **Share** your solution and show others what you've created!



Sustainable Development Goals

The SDGs are 17 global goals the United Nations made to help the world be a better place by 2030. They focus on solving big problems like hunger, poverty, and climate change. By using the Engineering Design Process, you can come up with creative ideas to help solve these problems.

Getting Started

<u>If you are using a Climate Action lesson:</u>

1. Pick the SDG that you think best aligns with the provided 'Create' challenge.

<u>If you are creating your own product:</u>

1. Pick the SDG that interests you the most.
2. Think about a problem related to that SDG that you want to solve.

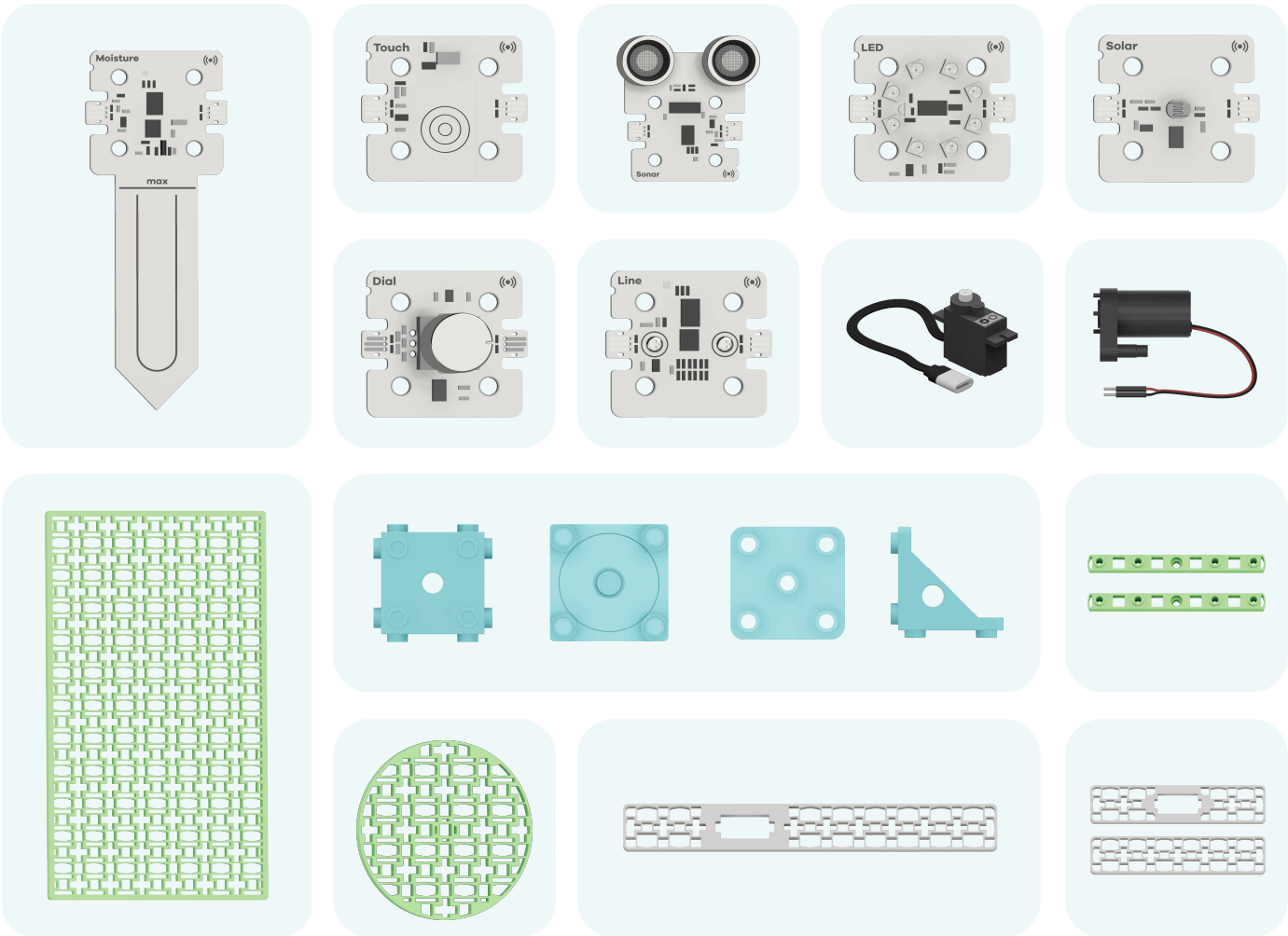
Meet the Climate Action Kit

Today, you are going to be using the Climate Action Kit to build our projects. The Climate Action Kit comes with 12 robotic components, 45 building blocks, and 14 additional parts like cable connectors and wheels.

You can piece together these parts to build and code working prototypes of real-life climate action technology! For example, you might build a wind turbine, a smart farm, an electric vehicle prototype, or even a beach light that is safe for sea turtles!

Meet the Climate Action Kit

It's important to understand the different parts of the kit, so you know what is possible in your build. You can check out video tutorials for each component or read about them in the knowledge base.



Remember, you can always use found materials like LEGO® or craft supplies to add unique features! Check out these examples for inspiration.

STEP 1: ASK

Define the Problem

ACTIVITY

The first step in the Engineering Design Process is to figure out the problem you want to solve.

Think about the challenge provided in the lesson and/or the SDG you chose. Write a sentence that clearly *describes* the problem, *who* it affects and *why* it needs to be solved.

TIPS

1. Keep your problem statement short and to the point. It should be easy to understand.
2. Try to explain the problem to a friend or family member. If they understand it quickly, you've done a good job.
3. You can always refine your problem statement after you do more research!

Do Your Research

ACTIVITY

Before you jump to a solution, you need to make sure you understand the problem.

Try doing some rapid research on your problem. Find out why the problem occurs, who it affects, and what has been tried before. This will help you understand the issue better and come up with the best solutions. Document what you learn in this workbook:

Source	Type	Key Points	Insights

TIPS

1. Try using online databases like Google Scholar to find more detailed information.
2. How can you tell if a source is reliable? Remember these tips or watch this Crash Course video!

Run Interviews

ACTIVITY

Interviews can help you understand the problem by talking to people who are affected by it. By asking good questions and listening carefully, you can find out important information about what people need and how they feel.

Design some open-ended questions around your problem. Then, interview classmates, other teachers, parents, or friends! Write down the main things you learn from these conversations to help you come up with better solutions.

Date:
Interviewee:
Question 1:
Answer:
Question 2:
Answer:
Question 3:
Answer:
Question 4:
Answer:
Question 5:
Answer:
Question 6:
Answer:

List Solution Requirements

ACTIVITY

Knowing what your solution needs to do and what limits you have is really important. These are called success criteria and constraints.

Think about your research and identify:

1. **Success Criteria**: Think about what your solution should do to be considered successful. These are the goals your solution should meet.
   Examples: "The solution must reduce waste by at least 50%," "The device must work for 8 hours without stopping," or "The solution must be able to tell how bright the current environment is."

2. **Constraints**: Consider any limits or challenges that might affect how you create your solution. These could be things like materials, time, money, or rules about what you can use.
   Examples: "The project must be finished in 2 weeks," "We can only spend $50," or "We need to use materials that can be recycled."

STEP 2: IMAGINE

Brainstorm Time!

ACTIVITY

What are all the possible ways you could solve the problem with the Climate Action Kit? Write down every idea that comes to mind.

Idea	Description	Sketch
1		
2		
3		
4		

TIP

Don’t limit your thinking—sometimes the most unusual ideas are the best!

STEP 3: PLAN

Pick Your Best Idea

ACTIVITY

Now that you've brainstormed lots of ideas, it's time to choose the best one. To do this, we'll evaluate each idea against the list of success criteria and constraints you created in the Requirements activity.

Instructions

1. Review your requirements and write down each in the worksheet below.
2. Check whether each idea meets your success criteria and constraints. Use a simple system to evaluate: Yes (✅), No (❌), or Maybe (➖).
3. After evaluating each idea, choose the one that meets the most criteria and constraints. This is the idea you'll move forward with.

Solution Requirement	Idea 1	Idea 2	Idea 3	Idea 4

TIP

It's okay if an idea doesn't meet every requirement perfectly. Choose the one this is the strongest overall. If you have ideas that don't fully meet the criteria, think about how you could modify them to work better.

STEP 4: CREATE

Create a Prototype

ACTIVITY

Now that you've chosen your best idea, it's time to bring it to life by creating a physical prototype and planning the code that will make it work.

Physical Prototype

Step 1: Sketch Your Design
Draw what your physical prototype will look like. Think about the components from the Climate Action Kit you will use.

Step 2: List Your Materials
Write down all the materials and components you'll need from the Climate Action Kit, plus any additional items.

Building Blocks **Robotic Components** **Craft Supplies**

Create a Prototype

ACTIVITY

Code

Step 1. Describe Your Program
Clearly state what you'd like your prototype to be able to do once it is coded.

Step 2. Identify Triggers and Actions
Explain how users will interact with your prototype.

Trigger	Action
Example: 'A' button pressed	*LEDs light up*

TIP

Start with simple code and build up to more complex features as you get comfortable. You can always come back and add features later.

You can also try our Creating Algorithms with Flowchart activity to plan the project's code in more detail!

STEP 5: IMPROVE

Test It Out!

ACTIVITY

Now that you've built your prototype, it's time to test it out! Testing helps you find out what's working well and what needs to be improved. You'll be evaluating your prototype against the success criteria and constraints you set earlier.

Instructions

1. Set up your tests
    - List all the features of your prototype that you will need to test.
    - Think about different situations where your prototype will be used. For example, "What happens when the button is pressed?" or "Does it work in different lighting?"

2. Run each test
    - Write down what happened. Did the prototype work as expected? Were there any problems?

3. Evaluate the prototype
    - Check if your prototype met the requirements you set earlier.
    - Note any issues and think about how you can fix them.

Test It Out!

ACTIVITY

Feature/ Function	Testing Scenario	Expected Outcome	Actual Outcome	Success?
Example: Button Press	*Press the button in normal light*	*LEDs light up*	*LEDs light up*	*Yes*
Example: Gate closes at night	*Cover solar sensor to simulate night*	*Gate closes*	*Gate stayed open*	*No*

TIP

Be honest in your evaluation. It's okay if something didn't work perfectly—testing is all about learning and improving.

Test It Out!

ACTIVITY

After testing and evaluating your prototype, it's important to reflect on what you've learned. This reflection will help you make better decisions for your next iteration.

List any problems you encountered and plan out how you might address them. As you work on your prototype, keep track of your changes in the 'Status' column.

Problem	Next Steps	Status

TIP

Be sure to make any necessary fixes before moving on to user testing!

Get Feedback from Users

ACTIVITY

User testing is a important step in understanding how well your prototype works for the people it's designed for. In this activity, you'll organize a user testing session and collect feedback from the users to help you improve your design.

Get Ready for User Testing

1. Decide who will test your prototype, like classmates or family members.
2. Decide what you want users to do with your prototype, such as pressing a button or navigating a menu.
3. Think of questions to ask users after they test your prototype to learn about their experience and any problems they had. For example:
    - What did you like most about using the prototype?
    - Was there anything you found difficult about using the prototype?
    - Did the prototype do what you expected? Why or why not?
    - Is there anything you would change about the prototype?

Run the Test

1. Start by telling users what your prototype is and how it works.
2. Watch how users interact with your prototype. Take notes on what they do, where they struggle, and any questions they ask.
3. After testing, ask users the questions you prepared. Document their responses in the feedback form on the next slide.

TIP

Test your prototype with different types of users to get a wide range of feedback! This will help make sure your solution works for

Get Feedback from Users

ACTIVITY

User:

Task	Observation	User Feedback	Improvement Suggestions
Example: Press the button	*Had trouble finding the button*	*"The button is hard to find."*	*Make the button more visible.*

Questions

1. What did you like most about using the prototype?
2. Did the prototype do what you expected? Why or why not?
3. [Next question]
4. [Next question]

Organize User Feedback

ACTIVITY

Look for common issues or suggestions that multiple users mentioned.

How will you use the feedback to improve your design? What changes will you make?

Common Problem	Next Steps	Status

TIP

Focus on the feedback that will make the biggest difference for users.

STEP 6: SHARE

Share Your Solution

ACTIVITY

After designing your prototype, the next step is to share your solution!

How will you communicate your solution in a way that's clear and engaging for your audience?

		Your Answers
Step 1	**Identify Your Audience** Think about who will be viewing or listening to your presentation. Are they classmates, teachers, community members, or experts?	
Step 2	**Choose Your Medium** Choose the best way to communicate your solution. This could be a slideshow, a video, a poster, a live demonstration, or a written report. Pick the one that best suits your audience and the message you want to convey.	
Step 3	**Outline Key Points** What are the main points to cover? What is relevant to your audience? This might include: • What you learned about the problem • Your prototype design • Results from testing • Challenges you faced and how you overcame them • Further improvements you'd like to make	
Step 4	**Write A Rough Draft** Remember to use appropriate vocabulary that your audience will understand. Consider using visuals like diagrams, photos, or videos!	
Step 5	**Review and Revise** Get feedback from your peers or teachers and improve your presentation.	
Step 6	**Rehearse(for live presentations)** Researse to get comfortable with material, timing, and potential questions!	

Final Prototype

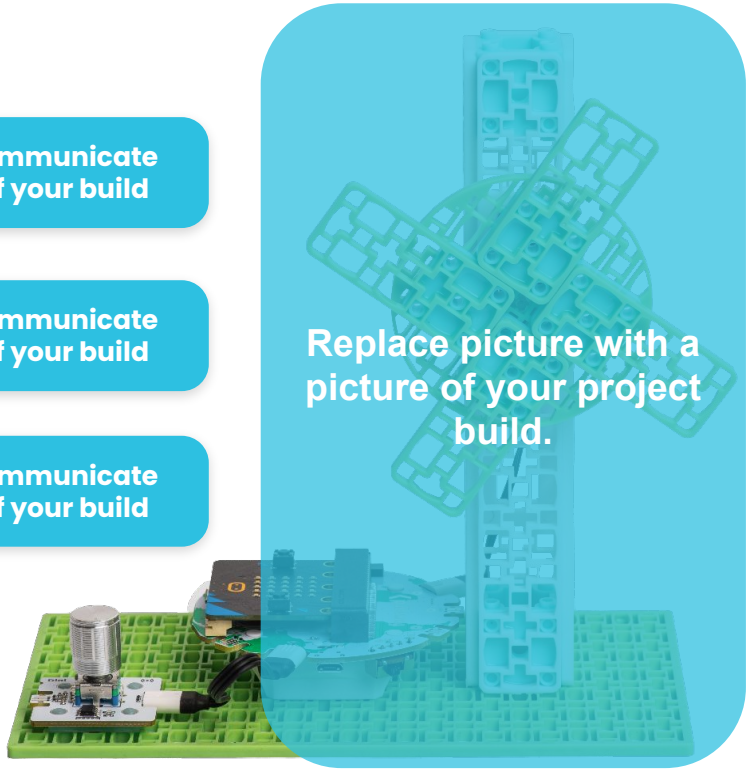
ACTIVITY

Take a picture of your final prototype and share:

Use these to communicate key features of your build

Use these to communicate key features of your build

Use these to communicate key features of your build



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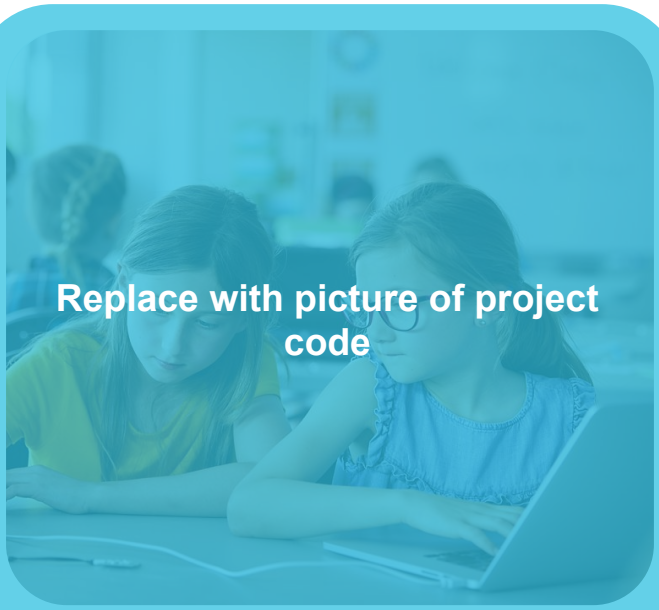
Final Code

- Describe what your project code does



Link to MakeCode Project: