

## Green Building

### OBJECTIVES

Students will:

- Define green building.
- Understand steps that can be taken during the building process to decrease negative environmental impact.
- Investigate components of green building.
- Design green spaces.

### OVERVIEW

Students will learn about the green building movement and discuss its implications for human impact on the environment, especially with regards to energy, water, and waste. Using the engineering design process as a model, students will construct a plan for a fictitious building project with suggestions on how to reduce the overall negative impact on the environment.

### TIMING

45–60 minutes

### MATERIALS NEEDED

- Pencils, one per student
- Devices with internet access, one per group
- **Green Library** student handout, one per student

### VOLUNTEER PREP

1. Read the activity instructions to familiarize yourself with the content. Note that timing guidance is provided as a recommendation, but each situation will be unique. Use the Lesson At-a-Glance below to determine how long you plan to spend on each section.
2. Prior to your session, coordinate with your host educator regarding available space and the ideal method to divide into groups of 3–4 students. This may include moving desks into groups before the start of the session.
3. Prepare all materials before your session.
4. Familiarize yourself with the information contained on the EPA's "[Components of Green Building](#)" webpage.
5. Have the **Essential Question** written largely on the board before students' arrival.

## LESSON AT-A-GLANCE

Section	Activity	Approximate Time in a 45-minute Session	Approximate Time in a 60-minute Session
Engage	Volunteer introductions and <b>Essential Question</b>	6–8 minutes	6–8 minutes
Learn	Green building	7–10 minutes	9–14 minutes
Challenge	<b>Green Library</b>	20–25 minutes	25–30 minutes
Discuss	Group share	5 minutes	5–7 minutes
Closing	Call to action	2–3 minutes	3–5 minutes

## PROCEDURE

## Engage

1. Take **2–3 minutes** to introduce yourself to the class. Explain that you are here on behalf of Trane Technologies, and you are excited to help teach them about green building and how it relates to sustainability. Briefly explain your role at Trane Technologies and a step Trane Technologies has taken to create green spaces, such as creating more efficient heating and cooling systems that use less energy.
2. For approximately **4–5 minutes**, engage students in the upcoming lesson by asking the following **Essential Question**. This question is intended to get students thinking about their upcoming learning experience and does not have a right or wrong answer.
  - How can we adapt what already exists to reduce negative effects on the environment?

## Learn

3. Tell students that one thing that can be done to decrease negative impact on the environment, as well as the topic of today's session, is *green building* (also referred to as green architecture). You may want to write this term on the board for reference.
4. Explain to students that green building means building with the environment in mind. It is creating structures and using building processes that are environmentally responsible and resource efficient throughout the entire span of a project—from finding the building site, construction, operation, maintenance, renovation, and even deconstruction if necessary.<sup>1</sup>

<sup>1</sup> <https://bit.ly/3Q5htoE>

5. Acknowledge that green building can be a difficult and expensive endeavor for companies, but the purpose is to make the environment and the people who use the structures healthier. Green builders aim to reduce waste and pollution, increase human productivity, and use resources efficiently.
6. There are several initiatives one can take when setting out to build green. One can incorporate green building materials or recycled materials. More sustainable building materials can be made from renewable resources. A builder can work to decrease pollution and emissions in the indoor environment with heating and cooling systems, like what Trane Technologies offers. Lastly, one can reduce water usage by choosing smart appliances and planting native landscaping that requires less maintenance.

### Challenge

7. Divide students into groups of four. Based on the prior coordination with your host educator and the space you provide, have students grouped into desks of four or sitting in circles on the floor. Make sure each group has a device with internet access.
  - **Note:** The number of groups will be determined by the size of the class. For example, if you have a class of 24 students, you will have six groups. Count students off into groups based on class size. Go through the class and count 1–6 until all students have a number. Send students to the designated area for each group number. Adjust based on total number of students.
8. Pass out a **Green Library** handout to each group. Read the instructions and answer any questions as they arise.
9. Direct students' attention to the brainstorming bubble. Give them **4–5 minutes** to ideate, reminding them to write down *all* ideas they have without judgement.
10. At the end of the brainstorming period, instruct students to work together to categorize their ideas and prioritize them based on the city's requests. Emphasize that this is the time in which some ideas might be scrapped. Encourage them to only include the most relevant or effective ideas. Reinforce that this discussion might act as a springboard for their group to come up with new ideas or build on those of others. There is space for them to record these new ideas in the handout.
11. For the next 15–20 minutes, instruct students to write an explanation of their green library plan and draw a model to "present to the city." They can either draw a full model of the library, or they can draw prototype models of specific aspects they have mentioned in their plan.

### Discuss

12. Facilitate a brief discussion that gives students the opportunity to share their green building ideas and drawings. If time allows, ask other groups to give feedback.

## Closing

13. Before you leave, thank the classroom teacher and students for allowing you to join them today, and encourage them to keep their eyes open for evidence of green building efforts in their town. Challenge them to discuss with their families if there is anything they learned that could be implemented in their own homes.

## **EXTENSION IDEAS FOR EDUCATORS**

- Conduct a building audit of the school building and make recommendations on aspects that could be changed according to green building principles.
- Taking the ideas of all groups, work as a class to write a proposal to the city on how to build a green library, town hall, community center, etc., and present it at a city council meeting or send a letter to the mayor.

## **NATIONAL CONTENT STANDARDS**

### **National Science Standards**

- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

### **Common Core State Standards for English Language Arts**

#### Speaking and Listening

- CCSS.ELA-LITERACY.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-LITERACY.CCRA.SL.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
- CCSS.ELA-LITERACY.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-LITERACY.CCRA.W.7 Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.

### **Science and Engineering Practices**

- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions

**Scenario:** Your architecture firm has been hired to build the town's new library. Your firm was picked because of its commitment to **green building** and minimalization of the negative environmental impact of building a new space. Using the Environmental Protection Agency's resources and the engineering design knowledge of your team, create a plan for a green library!

**EPA'S COMPONENTS OF GREEN BUILDING**

<https://archive.epa.gov/greenbuilding/web/html/components.html>

**Ideate:** As a group, think of all the aspects of your new library that could be "green" and minimize the negative impact on the environment. Remember to write down *all* ideas during this brainstorming process!



**PLAN:** The city has identified four key priorities in the building of their new library: energy, water, waste, and landscaping/décor. Look at the brainstorming ideas from everyone on your team. Prioritize the most important and try to categorize them into the buckets below.

Energy	Water	Waste	Landscaping/Decor

What other initiatives could you implement or materials could you use to build your green library according to the city's priorities? Record any new ideas you have below:



**Model/Prototype:** Use the space below to draw a model of your green library, labeling essential elements you would like to point out to the city. You may also choose to draw prototype diagrams of specific aspects of your building plan.

