

Green Building Revolution

AIM

This green tech curriculum is intended to support ESL and vocational students who are attending green training programs. The lesson seeks to develop understanding of key concepts related to green building design as well as language skills for English language learners, including vocabulary pertaining to this subject area.

OBJECTIVES

At the end of this session, students will be able to:

- Understand the connection between human activities and the impact on the environment.
- Identify the meaning of sustainability as it relates to the construction industry.
- Assess the importance of building codes.
- Critically analyze key ideas in the “Green Building Revolution” video clip.
- Evaluate the potential of the green building movement as it relates to employment.

TARGET GROUP

Intermediate to advanced ESL students (levels 6–9)
(For the purpose of this lesson, the target group levels range from 1 through 8, with the following guidelines: 1 = beginning, 5 = intermediate, 8 = advanced.)

NOTE

This lesson was developed for potential candidates of the San Francisco CityBuild program, a job training program underwritten by the Mayor’s Office on Workforce and Economic Development. Another program of interest to students, also underwritten by the Mayor’s Office, is the Green Launch Pad program at City College of San Francisco.

OVERVIEW

In this lesson, students develop an awareness of how the construction industry is becoming increasingly green through sustainable design and construction of buildings—that is, buildings constructed with water conservation and energy efficiency as guiding principles, together with the selection of materials that protect the environment and the future of the planet.

Note: Except for the crossword puzzle, the activities in this lesson can be delivered online. The crossword will need to be printed out. With online delivery, instructions for the activities will need to be explained very clearly.

DAY ONE ACTIVITIES

1. Warm-up activity

Begin by asking the class to name some things that cause pollution in their city. Elicit a range of answers from the students and write them on the board.

Ask: How does pollution link to global warming? Is there a connection? Have students work in pairs and give them time to review these links to explore the connection.

• **Clue into Climate: Carbon Dioxide and Climate Change**

<http://uw.kqed.org/edresources/plans/lesson-1a-carbon-dioxide-and-climate-change.pdf?trackurl=true>

• **National Geographic: Causes of Global Warming**

<http://environment.nationalgeographic.com/environment/global-warming/gw-causes>

With the whole class, review students’ understanding of the connection between human activities and impact on the environment.

If students are sufficiently proficient in English, project the following PDF onto a classroom wall to illustrate the operation of the greenhouse effect:

<http://www.kqed.org/assets/pdf/education/educators/the-greenhouse-effect.pdf>

CityBuild Job Training Program

<http://www.sfcta.org/content/view/281/101/>

Green Launch Pad Program

<http://www.heysf.org/city-college-of-san-francisco-offering-green-job-training-program-2386.html>

LENGTH

2 hours

MATERIALS

- Clue into Climate: Carbon Dioxide and Climate Change <http://uw.kqed.org/edresources/plans/lesson-1a-carbon-dioxide-and-climate-change.pdf?trackurl=true>
- National Geographic: Causes of Global Warming <http://environment.nationalgeographic.com/environment/global-warming/gw-causes>
- Clue into Climate: The Greenhouse Effect and Greenhouse Gases (PDF) <http://www.kqed.org/assets/pdf/education/educators/the-greenhouse-effect.pdf>
- Sustainable Design at the California Academy of Sciences http://www.calacademy.org/academy/building/sustainable_design/
- California Seismic Building Codes http://www.ehow.com/about_4692663_california-seismic-building-codes.html
- The Americans with Disabilities Act: A Brief Overview <http://askjan.org/links/adasummary.htm>
- Green Building Revolution <http://www.kqed.org/quest/television/green-building-revolution> from *QUEST*, A KQED Multimedia Series Exploring Northern California Science, Environment and Nature.

2. Pre-viewing activity for “Green Building Revolution” video clip

Assemble students in groups of four to discuss the following questions:

- What is the difference between using solar energy for electricity or using gasoline?
- Why should buildings be constructed close to public transportation?
- If recycled wood and steel are the same as new wood and steel, should they be used in the construction of new buildings? Why or why not?

Ask each group to nominate a representative to present the group’s opinions to the class. As groups report back, write their ideas on the board for discussion.

3. Vocabulary and discussion

To prepare students for the video clip from “*Green Building Revolution*,” introduce vocabulary they will need to understand. Ask them to fill in the blank spaces in each sentence using the vocabulary listed here, then review their choices with the whole group.

global warming	heavy industry	principal offenders
major culprit	gobble up	greenhouse gas emissions

1. Two of the _____ in polluting the environment are automobiles and _____.
2. Are you surprised that buildings are another _____ in producing _____?
3. Buildings _____ a large amount of electricity, water and raw materials, which can lead to a rise in the earth’s temperature, or _____.

DAY TWO ACTIVITIES

1. Sustainable architecture and sustainable building

Reconvene the groups of four from Day 1 and ask students to review the information on sustainable design at http://www.calacademy.org/academy/building/sustainable_design/

They should discuss the following question:

What are sustainable architecture and sustainable building?

Invite one student from each group to present their group’s understanding of what constitutes sustainable architecture and sustainable building. Write their ideas on the board.

Then ask students to work individually and fill in the blank spaces in each sentence using the vocabulary listed here.

sustainable architecture	sustainable buildings
high-performance buildings	building paradigm
huge impact	green building practices
LEED	

1. In modern building design, it is important to use materials, land and energy efficiently; this is called _____.
2. If you're able to reduce the use of electricity by even 10 percent in buildings, this will have a _____ on the environment.
3. If you build with a _____ certification as a goal, you are using _____.
4. _____ and _____ are other terms for green buildings.
5. In the recent past, the installation of solar panels, which make a building more energy efficient, was not widespread, but the _____ has changed as more individuals and builders are making this green building practice mainstream.

2. The importance of changing building codes

Explain to students that change is often resisted. The construction industry initially thought that *seismic* and *accessibility* standards for buildings would be too expensive, but they are now adopted as a matter of practice. Ensure that students understand these terms.

The same situation exists for green building codes. There is resistance, but someday these codes will be applied as a matter of course.

Before the students complete this section, have them gather in groups of four and research these links about seismic and accessibility standards for buildings.

- http://www.ehow.com/about_4692663_california-seismic-building-codes.html
- <http://askjan.org/links/adasummary.htm>

In their groups, ask them to respond to the following questions:

- Why are seismic standards important in California?
- Have accessibility standards had a positive or a negative effect on American society?
- If green building practices become the law of the land, as have seismic and accessibility standards, will this create more job opportunities or fewer job opportunities in the construction industry?

Invite one student from each group to present their group's opinions on the questions. Then ask students to work individually and fill in the blank spaces in each sentence using the vocabulary listed here.

industry standard	seismic standards	mainstream
structurally sound	accessibility standards	

1. When a building practice, such as the use of solar panels for buildings, is widely adopted in terms of use and installation, it becomes an _____.
2. In California, modern buildings all follow building codes that are required by law. Building practices that follow earthquake safety for a building are called _____.
3. If a building in California is built to code for earthquake safety, it would be considered _____.
4. In the American for Disabilities Act, our government requires that all buildings be built so that people regardless of their disability can get into a building. These requirements are called _____.
5. When a building standard, such as earthquake safety or accessibility for all people, becomes a common practice, this is then considered a part of the _____.

DAY THREE ACTIVITIES

1. "Green Building Revolution" video clip

Screen the video segment Green Building Revolution from *QUEST*, A KQED Multimedia Series Exploring Northern California Science, Environment and Nature.

The segment can be found at

<http://www.kqed.org/quest/television/green-building-revolution>

Focus for viewing

Ask students to view the clip once with the following question in mind:

What is the major theme of this film?

Stream the clip a second time and encourage students to take notes in response to these more detailed questions:

1. What percentage of U.S. electricity is used in buildings every year?
2. What percentage of greenhouse gas emissions in the United States are buildings responsible for?
3. The LEED system rates buildings in five key areas. What are they?
4. What are the four grades with which the U.S. Green Building Council rates a building?
5. How much less energy does the California Academy of Sciences use than required by federal and state regulations?

Post-viewing

After viewing the segment again, ask students to first work individually to fill in the blanks in the sentences below and then to work with a partner to compare answers. Then have them share their answers with the whole group, and write the answers on the board.

Time: 00:00-00:56

Buildings every year, they _____ of U.S. electricity and consume _____ gallons of water and _____ of raw material like _____ and _____.

Time: 01:09-01:27

In 1998, a nonprofit group called the U.S. Green Building Council established a rating system called LEED; it stands for _____.

Time: 01:40-02:17

Since 2000, the LEED standards have been applied to more than _____ nationwide, including the new California Academy of Sciences in San Francisco.

Time: 02:18-02:35

Since _____, the California Academy of Sciences has resided in Golden Gate Park, but after _____ decades, _____ visitors and one major _____, the historic buildings were no longer _____.

Time: 10:45-11:42

High-_____ buildings like these are _____, they minimize _____ and they reduce overall _____ impact. They _____ costs and are _____ for occupants.

2. Review and recap

Ask students what they have taken away from this lesson. What do they recall in particular? Invite questions, thoughts and responses.

Challenge them with the following questions:

- What is the primary goal of the Green Building Council?
- How did people react to the possible requirement of seismic and accessibility standards before such standards became law?

Elicit their answers and write them on the board.

3. Small-group discussion

Ask students to work in groups of four to discuss the following questions, then have them present their findings to the class. Write their ideas on the board.

- If green building practices become the law of the land, do you think they will have a positive or a negative impact on your ability to get a job?
- What kinds of jobs in the field of construction contribute to making a house more energy efficient?

4. Crossword puzzle

Conclude the lesson with the crossword puzzle in Appendix 1. Students may enjoy this as a game to test their knowledge.

5. Assessment / review

To assess or reinforce understanding and recall of vocabulary and concepts covered in this lesson, assign the **True / False** and **Multiple Choice Questions** in Appendix 2.

DEVELOPED BY

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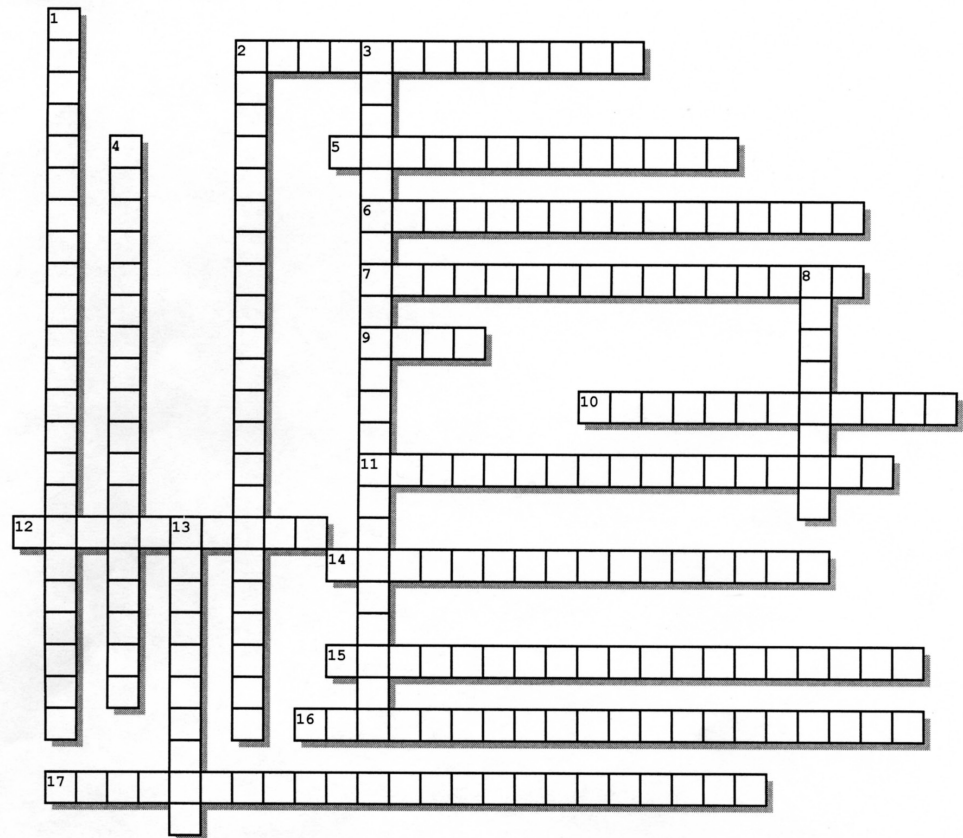
APPENDIX 1

Green Technology

Name: _____

Date: _____

Green Building



ACROSS

- 2 The earth is getting hotter
- 5 Factories
- 6 Building codes that govern how buildings should be built regarding earthquakes
- 7 A way of looking at how buildings should be built
- 9 Leadership in energy and environmental design
- 10 Something/someone who is primarily responsible for an action
- 11 A building that is built following the required building codes
- 12 An action that affects something in a big way
- 14 Generally accepted requirements followed by members of an industry
- 15 The burning of fossil fuels like gas can cause this
- 16 Green construction or green buildings
- 17 Environmentally conscious design technique

DOWN

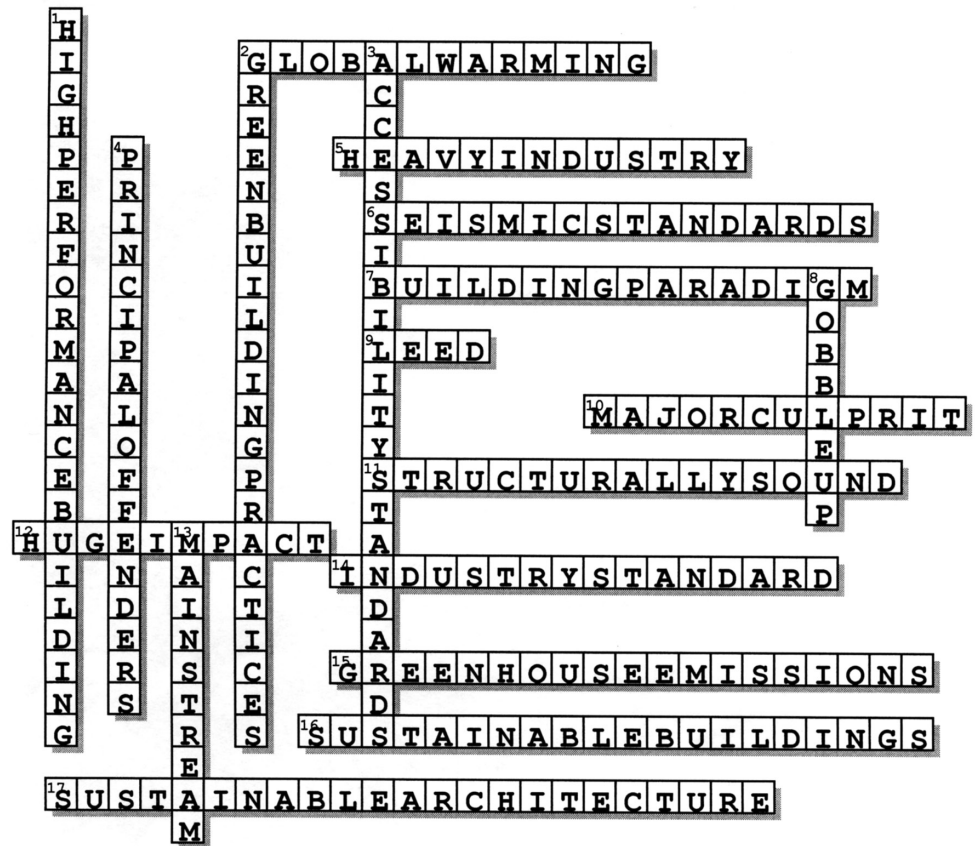
- 1 A green building
- 2 A method of how buildings are built
- 3 Building codes that govern how buildings should be built regarding ADA laws
- 4 Industries or companies that are the primarily responsible for a negative action
- 8 To use up something quickly
- 13 The common current thought of a majority of people

Green Technology

Name: _____

Date: _____

Green Building



APPENDIX 2

True / False and Multiple Choice Questions

Answer **TRUE** or **FALSE**

1. **Greenhouse gas emissions** are one of the reasons for global warming.
2. **Sustainable buildings** are not energy efficient.
3. **Heavy industry** is a **major culprit** in greenhouse gas emissions.
4. Buildings **gobble up** 50 percent of U.S. electricity.
5. A **principal offender** is someone or something that is a major cause of a problem.
6. The old **building paradigm** did not consider the use of renewable energy.
7. **Sustainable architecture** will not have a **huge impact** on global warming.
8. **LEED** stands for Leadership in Ecological and Environmental Design.
9. A **high-performance building** is an energy-efficient building.
10. **Green building practices** do not include using recycled materials.
11. An **industry standard** is an accepted practice within an industry.
12. **Accessibility standards** enable people regardless of their disabilities to get into a building.
13. When something is **mainstream**, it means that it is not widely accepted.
14. **Seismic standards** ensure that buildings are **structurally sound**.

Multiple Choice Questions: Choose the correct answer or answers.

1. **Green building practices** include _____.
 - a. Only energy efficiency.
 - b. Only recycled materials.
 - c. Both energy efficiency and recycled materials.
2. **LEED** means _____.
 - a. Leadership in Ecological and Environmental Design.
 - b. Leadership in Energy and Environmental Design.
 - c. Leadership in Efficiency and Environmental Design.
3. **Huge impact** means that something has _____.
 - a. A minor effect.
 - b. A major effect.
 - c. No effect.
4. A **high-performance building** is _____.
 - a. A green building.
 - b. Energy efficient.
 - c. A sustainable building.

5. **Sustainable architecture** includes _____
in its planning.
- Energy efficiency
 - Only new wood and steel materials
 - Green building practices
6. **Seismic standards** deal with _____.
- Safety.
 - The way a building is built.
 - Energy efficiency.
7. **Sustainable buildings** will help reduce _____.
- The 15 trillion gallons of water consumed by U.S. buildings each year.
 - The 3 billion tons of raw material used each year in construction.
 - 30 percent of all greenhouse gas emissions produced by buildings each year in the United States.
8. **Mainstream** refers to something that is accepted by _____.
- A majority of people.
 - A minority of people.
 - No one.
9. The new **building paradigm** is _____.
- Sustainable architecture.
 - Sustainable building.
 - Green building practices.
10. A **principal offender** is someone or something that is _____.
- Not responsible for an action.
 - Not primarily responsible for an action.
 - Primarily responsible for an action.
11. **Gobble up** means to _____.
- Eat something quickly.
 - Use up something quickly.
 - Throw away something.
12. **Major culprits** in the cause of global warming are _____.
- Heavy industry.
 - Buildings.
 - Cars.

13. An **industry standard** is _____.
 - a. An accepted method of doing something within an industry.
 - b. Not an accepted method of doing something within an industry.
 - c. Considered mainstream within an industry.

14. A building that is **structurally sound** is built _____.
 - a. To be a safe building.
 - b. To be seismically safe.
 - c. To codes as prescribed by law.

15. **Seismic standards** are _____.
 - a. Important for safety.
 - b. Concerned with safety in case of an earthquake.
 - c. Prescribed by law.

16. **Accessibility standards** _____.
 - a. Are codes that are related to the Americans for Disability Act.
 - b. Allow people with disabilities to have the same access that those without disabilities have.
 - c. Are prescribed by law.

ANSWERS

True / False and Multiple Choice Questions

Answer **TRUE** or **FALSE**

1. **Greenhouse gas emissions** are one of the reasons for global warming. **T**
2. **Sustainable buildings** are not energy efficient. **F**
3. **Heavy industry** is a **major culprit** in greenhouse gas emissions. **T**
4. Buildings **gobble up** 50 percent of U.S. electricity. **F**
5. A **principal offender** is someone or something that is a major cause of a problem. **T**
6. The old **building paradigm** did not consider the use of renewable energy. **T**
7. **Sustainable architecture** will not have a **huge impact** on global warming. **F**
8. **LEED** stands for Leadership in Ecological and Environmental Design. **F**
9. A **high-performance building** is an energy-efficient building. **T**
10. **Green building practices** do not include using recycled materials. **F**
11. An **industry standard** is an accepted practice within an industry. **T**
12. **Accessibility standards** enable people regardless of their disabilities to get into a building. **T**
13. When something is **mainstream**, it means that it is not widely accepted. **F**
14. **Seismic standards** ensure that buildings are **structurally sound**. **T**

Multiple Choice Questions: Choose the correct answer or answers.

1. **Green building practices** include _____.
 - a. Only energy efficiency.
 - b. Only recycled materials.
 - c. Both energy efficiency and recycled materials.**
2. **LEED** means _____.
 - a. Leadership in Ecological and Environmental Design.
 - b. Leadership in Energy and Environmental Design.**
 - c. Leadership in Efficiency and Environmental Design.
3. **Huge impact** means that something has _____.
 - a. A minor effect.
 - b. A major effect.**
 - c. No effect.
4. A **high-performance building** is _____.
 - a. A green building.**
 - b. Energy efficient.**
 - c. A sustainable building.**

5. **Sustainable architecture** includes _____
in its planning.
- a. **Energy efficiency**
 - b. Only new wood and steel materials
 - c. **Green building practices**
6. **Seismic standards** deal with _____.
- a. **Safety.**
 - b. **The way a building is built.**
 - c. Energy efficiency.
7. **Sustainable buildings** will help reduce _____.
- a. **The 15 trillion gallons of water consumed by U.S. buildings each year.**
 - b. **The 3 billion tons of raw material used each year in construction.**
 - c. **30 percent of all greenhouse gas emissions produced by buildings each year in the United States.**
8. **Mainstream** refers to something that is accepted by _____.
- a. **A majority of people.**
 - b. A minority of people.
 - c. No one.
9. The new **building paradigm** is _____.
- a. **Sustainable architecture.**
 - b. **Sustainable building.**
 - c. **Green building practices.**
10. A **principal offender** is someone or something that is _____.
- a. Not responsible for an action.
 - b. Not primarily responsible for an action.
 - c. **Primarily responsible for an action.**
11. **Gobble up** means to _____.
- a. Eat something quickly.
 - b. **Use up something quickly.**
 - c. Throw away something.
12. **Major culprits** in the cause of global warming are _____.
- a. **Heavy industry.**
 - b. **Buildings.**
 - c. **Cars.**

13. An **industry standard** is _____.
- a. **An accepted method of doing something within an industry.**
 - b. Not an accepted method of doing something within an industry.
 - c. **Considered mainstream within an industry.**
14. A building that is **structurally sound** is built _____.
- a. **To be a safe building.**
 - b. **To be seismically safe.**
 - c. **To codes as prescribed by law.**
15. **Seismic standards** are _____.
- a. **Important for safety.**
 - b. **Concerned with safety in case of an earthquake.**
 - c. **Prescribed by law.**
16. **Accessibility standards** _____.
- a. **Are codes that are related to the Americans for Disability Act.**
 - b. **Allow people with disabilities to have the same access that those without disabilities have.**
 - c. **Are prescribed by law.**

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