Nature's Impact on Buildings

How do humans, weather elements, and other living things impact buildings over time?

Theme

This lesson uses the school building as a case study for investigating how weather, plants, animals, insects, gravity, and people affect architecture. Students will identify how the materials in the built environment have changed over time, understand cause and effect relationships, and identify solutions for change. Buildings, just like people, need to stay healthy to maintain long lives.

Student Objectives

- discuss three ways in which humans, weather elements, and other living things impact building materials
- conduct a building inspection and analyze the results
- prepare a building health report for school officials

Activities

- scavenger hunt around the school to find how building materials have changed
- compile information for a chart on the health of the school building
- use clear descriptive writing and facts to support information about the health of the school building

Type

- indoor, classroom activities
- outdoor, walk-around-the-school activity

Timeframe

three class sessions of 30 minutes each

Materials

- **Handout A** - images of building materials that have changed over time
- **Handout B** - scavenger hunt chart for identifying materials
- pencils, sketch paper
- *optional but helpful:* clipboards
- *optional but helpful:* camera

Teacher Prep

- photocopy or scan **Handout A** for display or projection
- photocopy **Handout B** *(one or more copies per student or student pair)*
- scope out several places in your school where building materials have changed over time

Vocabulary

deteriorate, deterioration to become worse over time

maintenance activities and practices that keep a building in good condition and help to prevent deterioration

symptoms a change in a building (or a person) showing signs that it has a problem

causes something or someone that produces the symptoms

treatments the method of helping

gravity the invisible force that pulls everything on earth towards the earth

vandalism damage to buildings done on purpose by people

Discussion Points

- Just as people need to stay healthy to maintain long lives, buildings must be maintained in order to stay strong. Make a connection between taking good care of a building and taking care of your body, such as going to the doctor, visiting the dentist, and eating nutritious foods. As we grow older we want to do everything we can to extend and improve the quality of our lives.
- What factors change building materials over time?
- How can we recognize these changes?
- What can we do to help preserve buildings?

Interdisciplinary Connection

Language Arts
Different verbs describe what happens to materials over time. Each material uses its own vocabulary word: paint blisters or peels, iron rusts, color fades, concrete spalls, wood warps, stone cracks, glass breaks, bricks stain, etc. Have your class research, create a chart, or make a matching exercise to share with their classmates to describe the different materials (nouns) and their changes (verbs). Students may also create a poem, rap, or chant that incorporates the terms.

Background Information for Teacher

It is important for students to view themselves as good stewards of the built environment as well good stewards of the natural environment. Your students may never have considered it, but a building is a renewable resource that needs constant care. A battle between maintenance and deterioration is silently going on inside and outside your school building right now. All buildings, whether fancy or plain, deteriorate over time.

This lesson encourages students to observe the condition of their school and to report their findings. Students study the relationships among weather elements, living things, and human factors while they investigate how building materials change over time.

It is a constant struggle to maintain any building. The choices students make as they use a building can either help or harm. Their actions will determine, in part, how long buildings will last.

What factors change building materials over time?

Natural environmental factors:
- sun
- wind
- water (humidity and precipitation)
- movement (earthquakes) and settling
- gravity
- fire (caused naturally)
- oxygen (oxidation, rust)

Other living things:
- plant life growing on the building, fungus / mold
- animals
- insects

Human factors:
- everyday use ("wear and tear")
- vandalism
- fire (arson)
- chemicals (acid rain, salt used to melt snow)

Students should begin to recognize that:

- Human use and the natural environment impact school buildings significantly.
- Buildings don't take care of themselves: it takes time, money, and human energy.
- Treating buildings with care and performing preventative maintenance helps to avoid bigger problems later on.

Activity Procedures

Pointing out ways in which the building materials have changed over time should be done in a caring and constructive manner.

DAY ONE

1 Use the Discussion Points to relate human health to building health. Talk about the terms: the symptoms, the causes, and the treatments. (Example: If you have a common cold, what are the symptoms, causes, and treatments for getting well?)

2 Introduce the idea that nature, humans, and other living things are working to break down what we have built. Have students brainstorm the factors that change building materials over time. Make a list on the board, dividing it into three categories: natural / environmental, other living things, and human use.

3 Use the photographs in **Handout A** to show examples of how building materials deteriorate. In each photograph, identify which factor (natural/environmental, other living things, or human) caused the material to deteriorate.

DAY TWO

4 Take a scavenger hunt around the interior and exterior of your school looking for ways in which building materials have changed. Use copies of **Handout B** to record this information. A camera and clipboards are optional but helpful. Photographs or sketches will help your students record situations and information. Note: You may want to scope out these problems and a path through the school ahead of time, so you can be prepared for what they find.

5 If your school building is too new to show such signs of wear and tear, consider touring a nearby older public building.

Encourage students to write clear descriptions on **Handout B**. Simply writing "it's broken" or "falling down" or "it's in bad condition" isn't enough. Encourage them to be specific and use adjectives to describe what they see, rather than make judgments.

Here are possible things to look for on your scavenger hunt:

- cracked mortar or missing bricks
- water stains or mildew on the side of the building
- interior and exterior stair treads that have worn down over time
- cracked sidewalks due to wear, freeze and thaw, or tree roots
- ivy or other plants growing on a building and eroding the surface
- rusted metal
- sagging wooden window frames
- peeling paint
- rotten wood
- cracked stone or concrete window sills
- graffiti
- insects living on or in the building structure
- teeth marks from squirrels or rodents that may have chewed on wood
- malicious damage or careless use by humans
- "wear and tear" by humans

Resources

Most of the books that explain how buildings and materials change over time are highly technical manuals. However, your students may enjoy learning from the pictures and explanations about what happens when the natural environment battles a building. Here are four of the best:

Caring for Your Historic House, Heritage Preservation and the National Park Service, Charles E. Fisher and Hugh C. Miller, eds. New York: Harry N. Abrams, 1998.

Caring for Your Old House: A Guide for Owners and Residents (Respectful Rehabilitation), Judith L. Kitchen. Washington, DC: Preservation Press, 1991.

Historic Building Facades: The Manual for Maintenance and Rehabilitation, William Foulks, ed. New York: John Wiley & Sons, Inc., 1997.

How Buildings Learn: What Happens After They're Built, Stewart Brand. New York: Viking, 1994.

Illinois Learning Standards and Benchmarks

11A Know and apply the concepts, principles and processes of scientific inquiry.

11.A.2a Formulate questions on a specific science topic and choose the steps needed to answer the questions.

11.A.2b Collect data for investigations using scientific process skills including observing, estimating and measuring.

11.A.2c Construct charts and visualizations to display data.

11.A.2d Use data to produce reasonable explanations.

11.A.2e Report and display results of the individual and group investigations.

12.E Know and apply concepts that describe the features and processes of the Earth and its resources.

12.E.2a Identify and explain natural cycles of the Earth's land, water and atmospheric systems.

12.E.2b Describe and explain short-term and long-term interactions of the Earth's components.

12.E.2c Identify and classify recyclable materials.

13B Know and apply concepts that describe the interaction between science, technology and society.

13.B.2d Compare the relative effectiveness of reducing, reusing, and recycling in actual situations.

DAY THREE

6 Once you have completed the scavenger hunt, have students rank the problems found in order of seriousness or give several aspects of the building a letter grade similar to a report card. Examples might include: painted walls in our classroom = A, front stone steps = C, graffiti = B+.

Ask students to think of all the ways they can help to maintain their school building. Examples: not add any graffiti, don't carve into desks, close windows during rainstorms so water cannot get into the building, not break or maliciously damage doors or windows, etc.

7 Have your students prepare a written health report on the condition of your school building using the observations, photos, and drawings they have gathered on **Handout B**. Perhaps have students divide up and present only the interior or exterior conditions. Students should include recommendations that focus on how they can help make positive changes in the condition of the school. Specific examples and clear writing should be used to explain their conclusions. Include information on symptoms, causes, and treatments. Present this "Building Health Report" to the principal.

Extensions

- Once your students have finished the scavenger hunt, invite a contractor into your class to discuss and present their findings. Have the contractor talk more about symptoms, causes, and treatments for deteriorating building materials.

- Conduct a recycling audit at your school. Ask students to find out: What types of items are recycled? Which items are not? How well do students participate in the program? What can students do to increase the amount of recycling that occurs in your school? For a research project, have students find out where recyclables go after they leave your school.

Handout A

TOP LEFT A wooden roof damaged by water. (CAF, 1999) **TOP MIDDLE** A cracked concrete foundation of a house. (CAF, 1999) **TOP RIGHT** Plant life growing on the foundation of a building. (CAF, 1999) **BOTTOM LEFT** Graffiti sprayed on a brick house. (CAF, 1999) **BOTTOM MIDDLE** Bricks missing from the corner of a building. (CAF, 1999) **BOTTOM RIGHT** Paint peeling off the walls and ceiling of a room. (CAF, 1999)

Handout B

My name or group name _____

Today's date _____

Name and location of the building we are investigating

_____

_____

Year the building was constructed _____

Number of years people have used this building _____

Location and room of the building material (ex. classroom)	**Building materials** (ex. plaster walls)	**Symptoms** (ex. corners chipped)	**Causes** (ex. desks, chairs bumping into walls)	**Treatments** (ex. patching, repair, taking care in the future not to bump chairs into it)	**Rating / Grade** (ex. B+)