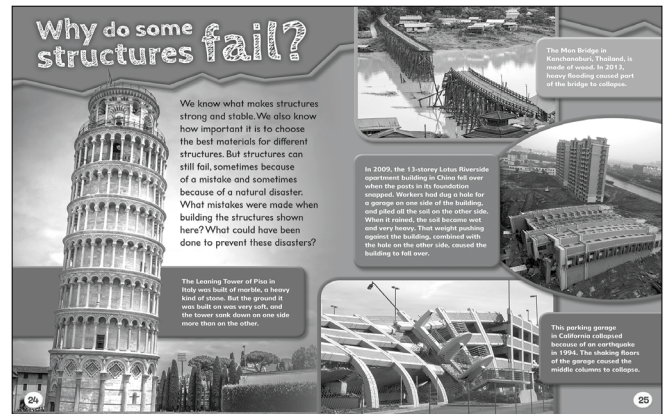
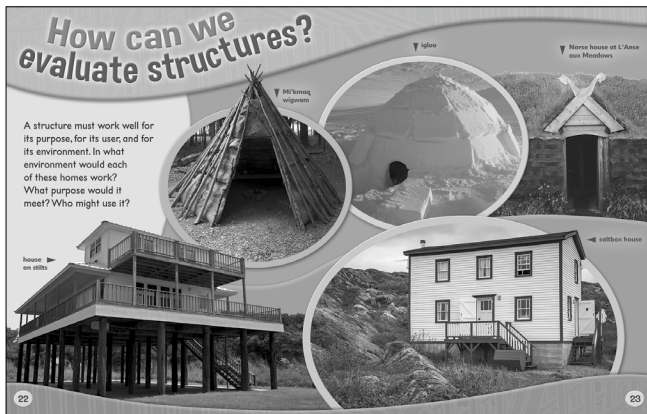


How Can We Evaluate Structures?



Focus: Students evaluate the effectiveness and appropriateness of structures, and design a model home.

Specific Curriculum Outcomes

Students will be expected to:

- 27.0 evaluate structures to determine if they are effective and safe, if they make efficient use of materials, and if they are appropriate to the user and the environment [GCO 1/3]
- 28.0 identify problems to be solved [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- ask questions to help evaluate structures
- collaborate with others to design a model home that satisfies certain criteria

NOTES:

Attitude Outcome Statements

Encourage students to:

- work with others in exploring and investigating [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- communicate information and ideas effectively and clearly, and to respond personally and critically [GCO 2]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine pages 22–25 • IWB Activity 7 Literacy Place: • <i>Tunnel Vision: Building an Underwater Tunnel</i> (Guided Reading, Level R)	• any version of <i>The Three Little Pigs</i> • various drawing materials (grid paper, sketch paper, rulers) • various model-building materials (modelling clay, blocks of wood, Lego bricks, foam blocks) • computers or tablets with Internet access	• Create a “bookbag” out of aluminum foil, using pipe cleaners for handles and adding any other necessary materials. • Invite an Elder or Indigenous Knowledge Keeper to visit the class.	• evaluate • failure

Science Background

- Structural failures are often due to a lack of planning for natural disasters, such as earthquakes, hurricanes, and floods. They can also be the result of shortcuts taken or mistakes made during the design and/or construction process, including mathematical errors, such as miscalculating the maximum load a structure can bear. This is why the testing stage of the design process is so important, as are experiencing failures during this stage. Failures can lead to an improved design.

Possible Misconceptions

- Students might believe that any failure is a sign of incompetence and a reason for self-blame. The examples in this lesson are of structures designed and constructed by professionals, which should show students that anyone can make mistakes. It is important that students understand the potential benefits of such failures, in that they can be studied by people who can then make improvements.

ACTIVATE

Judge It!

Ask students what it means to evaluate something (to judge it, to decide how good it is). Show students a bookbag you have made out of aluminum foil and pipe cleaners. Ask them how they might go about evaluating it. What questions would they ask about the bag? Record the questions they suggest on chart paper. If necessary, model asking questions such as:

- What is the bag's purpose? Does it work for that purpose?
- Who will be using the bag? Will it work for those people?
- What are the properties of the materials in this bag?
- Were these materials the best ones to use?
- What materials could you use?

CONNECT



Evaluating Structures

Introduce pages 22–23 of the Student Magazine and read the title question aloud: *How can we evaluate structures?* Discuss the term “evaluate” with students and explain that they will be analyzing the structures shown to determine their overall effectiveness. Add “evaluate” to the Word Wall.

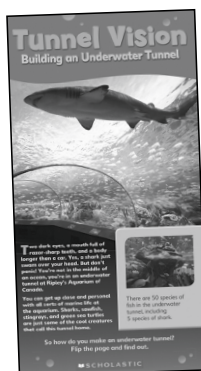
Have small groups each choose one of the shelters on the spread and answer the questions in the text for their shelter:

- In what environment would the home work?
- What purpose would it meet?
- Who might use it?

The Three Little Pigs

Read a version of *The Three Little Pigs* aloud. Then have students form small groups and ask them to evaluate each of the three houses in the story. Prompts for discussion might include:

- Which was the strongest, and why?
- Was the material chosen the best material for that structure?
- Did the structure have a solid foundation?
- How could the other two houses have been improved?



Literacy Place Connection:

Share *Tunnel Vision: Building an Underwater Tunnel* (Guided Reading, Level R) with students and discuss the process that was followed to build the tunnel. Invite students to evaluate the structures. Ask:

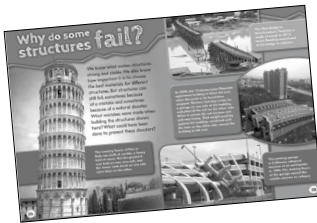
- What was the purpose of the tunnel? Did it work for that purpose?
- Who will be using the tunnel? Will it work for these people?
- What are the properties of the materials used in this structure?
- Were those materials the best ones to use?

CONSOLIDATE

Model Homes

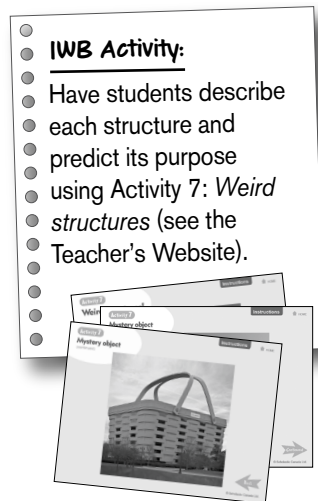
As a class, discuss the environment and climate where you live. Encourage students to brainstorm some of the building materials that are available in your area, and list them on the board. Then tell students that they are going to design a home that would be good for living in their area of the province.

Divide the class into small groups and have each group select a variety of drawing materials and building materials. Group members collaborate on a design, building materials, and fastening methods, and then draw a labelled sketch of their home indicating the materials and fasteners they chose. After the sketch has been approved, groups can build a model of their home using substitute materials, such as modelling clay or Lego bricks. Students can participate in a Gallery Walk to view other groups' labelled sketches and model homes.



Failed Structures

Have students look at the structural failures shown on pages 24–25 and read the text including the captions for each structure. Challenge students to suggest ways in which each failure might have been avoided. Students may choose one of the failed structures to research further and present their information to the class. Record any questions on the I Wonder Wall.



EXPLORE MORE

Indigenous Structures

Have students construct models of different structures found in a local Indigenous culture. Students could discuss why they think the traditional Indigenous peoples used the materials they did or why they did not build houses similar to the ones we see today (or the log cabins of early European settlers).

An Elder or Indigenous Knowledge Keeper could be invited to talk about how local and natural materials were used to build various structures including homes, shelter, transportation devices, storage containers, bags, tools, etc. If possible, ask a member of the local Indigenous community to lead a session where students use local materials to construct a structure using traditional Indigenous knowledge.

Impossible Structures

Have students create an “impossible structure” in Minecraft (<https://minecraft.net/en/>) using the Creative mode. In this mode, players have access to an unlimited number of different types of blocks. Since the laws of physics do not apply in this game (towers can be built upside down, etc.), players can imagine and build structures that could not be built in the real world. Once students have built their structures, they can work in small groups to identify problems that the structures would have if they were actually built.