



Teacher Tools

Lesson 4 Swing and Sway



Video Entry Topic: Wind Resistant Structures

OVERVIEW

Wind resistant structures: During severe weather, structures must often withstand very high winds.

Explain the danger and the science behind it.

Explain and/or demonstrate possible option(s) for protection and explain the science, technology, engineering and/or mathematics involved.

Length of Lesson: 2-3 class periods

Subject Area(s): Science, Technology, Visual Arts, Language Arts

OBJECTIVES

Students will:

- Research wind resistant structures;
- Determine the resulting effect of building structures that resist natural forces such as high wind;
- Determine the impact of building structures that resist natural forces such as high winds on society, the economy, and lives; and
- Research and present ways to build wind resistant structures.

MATERIALS

- Access to the Internet
- Paper straws (approximately 50 for each group of 3-4 students)
- Straight pins (approximately 50 for each group of 3-4 students)
- Large piece of cardboard and/or fan
- For final project, materials will vary. May include art materials, access to multimedia presentation software, Internet and e-mail, video equipment, etc.

PROCEDURE

1. Ask your students to recall the story of the three little pigs (see below for reference) and the idea that similar structures from different materials can react differently to severe wind.
2. You may also display the following Internet sites with visuals to establish more concrete examples for your students of wind and severe weather destruction.
 - [Discovery Channel videos on destructive winds](http://tiny.cc/1bMop) (see <http://tiny.cc/1bMop>)
 - [NOAA explanation of the Saffir-Simpson Hurricane Scale](http://tiny.cc/VhVZM) (see <http://tiny.cc/VhVZM>)
 - [Interview with Robert Simpson of the Saffir-Simpson Hurricane Scale](http://tiny.cc/glZmb) (see <http://tiny.cc/glZmb>)

Ask the students to consider the destructive force of wind and what types of structures and materials can withstand the force of winds during severe weather.

3. Provide groups of three to four students with paper straws and straight pins (approximately 50 of each). Use the straws and pins to build a strong and wind resistant structure. Give each group a large piece of cardboard and/or a fan that can be used to produce wind.
4. Have the groups present their structures to the class and explain why they have chosen their particular design and how it withstood the wind test. Make sure students include how they plan to initiate safety features for such items as doors and windows that they may not have included in the models.
5. Have the student groups present results of their testing to prove that their structure can be strong and wind resistant.
6. Students can research the topic and possible solutions using such Internet sites as:
 - [HowStuffWorks.com](http://www.HowStuffWorks.com) – Use search terms such as “wind resistant structures” and “skyscrapers”
 - [Discovery Channel](http://tiny.cc/xFihj) - Engineering the Impossible Video (see <http://tiny.cc/xFihj>)
 - [Argonne National Laboratory](http://tiny.cc/OCq25) - Wind Design for Buildings (see <http://tiny.cc/OCq25>)
 - [3M](http://tiny.cc/z2nng) – Window Films (see <http://tiny.cc/z2nng>)
 - [3M](http://tiny.cc/vjVgv) – Safety and Security Window Films (<http://tiny.cc/vjVgv>)
 - [Solar Security Films](http://tiny.cc/BtYqY) – Window Films Test Results (<http://tiny.cc/BtYqY>)

EXTENSIONS

- Have students design a shelter that is easy to assemble, sturdy, economical to produce, and could be distributed to shelter victims of natural disasters.
- Have students create a children's story based on *The Three Little Pigs* that explains how and why some structures are more wind resistant than others.

SUPER EXTENSION!

Have your students create individual videos that showcase what they know about wind resistant structures and enter them in the 2010 Discovery Education 3M Young Scientist Challenge for a chance to win a \$50,000 U.S. savings bond. To learn more about the [2010 Challenge](http://www.youngscientistchallenge.com), visit www.youngscientistchallenge.com.

EVALUATION

Use the following three-point rubric to evaluate students' work during this lesson. Students should be able to work cooperatively in teams, make thoughtful predictions, and follow directions to build their structures, perform the experiment, and draw conclusions from the experiment.

Three points: Students worked effectively in their groups, made predictions based on sound reasoning, followed directions and built the structures correctly, performed the experiments correctly, and were able to draw conclusions from the experiments.

Two points: Students worked somewhat effectively in their groups, made predictions based on somewhat sound reasoning, followed directions and performed the experiments adequately, and were able to draw some conclusions from the experiments.

One point: Students had difficulty working in their groups, made predictions that were largely guesses, followed directions but had difficulty performing the experiments, and had difficulty drawing conclusions from the experiments.

STANDARDS CORRELATION

This lesson plan may be used to address the academic standards listed below. These standards are drawn from Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education: 2nd Edition and have been provided courtesy of the [Mid-continent Research for Education and Learning](#) in Aurora, Colorado.

Grade level: 6-8

Subject area: Technology

Standard:

Identifies appropriate problems for technological design (e.g., identifies a specific need, considers its various aspects, considers criteria for a suitable product).

Benchmarks:

Designs a solution or product, taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety, aesthetics).

Grade level: 6-8

Subject area: Technology

Standard:

Understands the nature of technological design.

Benchmarks:

Identifies appropriate problems for technological design (e.g., identifies a specific need, considers its various aspects, considers criteria for a suitable product).

Grade level: 6-8

Subject area: Geography

Standard:

Understands how physical systems affect human systems.

Benchmarks:

Knows the ways in which humans prepare for natural hazards (e.g., earthquake preparedness, constructing houses on stilts in flood-prone areas, designation of hurricane shelters and evacuation routes in hurricane-prone areas).

The Three Little Pigs

There was an old sow with three little pigs, and as she had not enough to keep them, she sent them out to seek their fortune. The first that went off met a man with a bundle of straw, and said to him, "Please, man, give me that straw to build me a house." Which the man did, and the little pig built a house with it.

Presently came along a wolf, and knocked at the door, and said, "Little pig, little pig, let me come in." To which the pig answered, "No, no, by the hair of my chiny chin chin."

The wolf then answered to that, "Then I'll huff, and I'll puff, and I'll blow your house in." So he huffed, and he puffed, and he blew his house in, and ate up the little pig.

The second little pig met a man with a bundle of sticks, and said, "Please, man, give me those sticks to build a house." Which the man did, and the pig built his house.

Then along came the wolf, and said, "Little pig, little pig, let me come in." "No, no, by the hair of my chiny chin chin."

"Then I'll puff, and I'll huff, and I'll blow your house in." So he huffed, and he puffed, and he puffed, and he huffed, and at last he blew the house down, and he ate up the little pig.

The third little pig met a man with a load of bricks, and said, "Please, man, give me those bricks to build a house with." So the man gave him the bricks, and he built his house with them.

So the wolf came, as he did to the other little pigs, and said, "Little pig, little pig, let me come in." "No, no, by the hair of my chiny chin chin."

"Then I'll huff, and I'll puff, and I'll blow your house in."

Well, he huffed, and he puffed, and he huffed and he puffed, and he puffed and huffed; but he could *not* get the house down.