Tornado!

- **Subject:**
- **Grade(s):** 6-8
- **Duration:** Two class periods

Lesson Plan Sections

Objectives

Students will understand the following:

1. A scale called the Fujita Scale of Tornado Intensity rates wind-speed damage by tornadoes.
2. Engineers and architects can create tornado-proof designs for houses and other buildings.
3. By utilizing such designs, conditions can be made safer for people living in areas where tornadoes are frequent.

Materials

Either copy on the chalkboard or distribute to each student a copy of the Fujita Scale of Tornado Intensity.

- Research materials on tornado proofing buildings
- Computer with Internet access

Procedures

1. Review with your students what they have learned about tornadoes. Your discussion should include a description of what a tornado is like, what kind of damage a tornado can do to homes and other

structures, and how a tornado is formed.

2. Continue the discussion with a brief brainstorming session with the class about how engineers and architects could create and test designs for tornado-proof buildings.
3. Write on the chalkboard or distribute copies of the Fujita Scale of Tornado Intensity, explaining that this scale rates tornadoes according to wind speed and type and extent of damage to buildings.
4. Divide your class into groups, and have students use the materials you have provided in addition to the Internet to research work that has been done to design buildings that are tornado proof.
5. Have each group member use what he or she has learned from the research to design and draw a tornado-proof building.
6. Each student should write a paragraph describing his or her building and explaining the tornado-proof features.
7. Encourage groups to critique the different designs and select their best ones.
8. Have groups present their best designs to the class.
9. If possible, invite an architect to review the students' plans and explain why each would or would not be suited to withstand a tornado.

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Adaptations

Adaptations for Older Students:
In addition to drawing and describing a tornado-proof building, each student could draw up an architect's plan of his or her building.

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Discussion Questions

1. Why would people choose to live in Tornado Alley? Would you choose to live there (if you don't already)?
2. Do you think improved building codes would help lessen property loss during a tornado (see the Fujita Scale printed below)? What would you have to do to make a building "tornado proof"?
3. Would a ban on mobile homes in tornado-prone areas be a good idea or a bad one? Who would it affect and how?
4. Use the Fujita Scale printed below to determine what would happen to your community should an F-5 tornado go through the main business district in your community. Assume the tornado is moving at 60 mph and is on the ground for six minutes. The funnel is 1/8 mile across.

FUJITA SCALE OF TORNADO INTENSITY

Rating	Wind Speed	Damage
F-1	73 - 112 mph	Rips shingles off roofs; flips mobile homes.
F-2	113 - 157 mph	Upturns and flips boxcars.
F-3	158 - 206 mph	Exterior walls and roofs blown off homes. Metal buildings collapsed or severely damaged. Forests and farmland destroyed.
F-4	207 - 260 mph	Few walls left standing. Large concrete blocks launched far distances.
F-5	261 - 318 mph	Homes flattened with all debris removed. Schools, motels, and other larger structures damaged considerably with exterior walls and roofs gone. Top floors demolished.

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Evaluation

You can evaluate your students on their paragraphs using the following three-point rubric:

- **Three points:** building precisely described; tornado-proof features clearly explained; paragraph error-free

- **Two points:** building adequately described; explanation of tornado-proof features lacking in clarity; some errors

- **One point:** description vague; explanation lacking in clarity; numerous errors

You can ask your students to contribute to the assessment rubric by determining what type of information

should be included in the descriptions of the buildings.

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Extensions

What to Do
Divide the class into groups of three students each. Ask groups to imagine that they are safety engineers who have been asked to do consulting work for the town council of a small city in Tornado Alley (the area of high tornado frequency stretching from west Texas to the Dakotas). Have each group prepare a report listing simple steps people could take to lessen the damage caused by small flying objects during a tornado. Invite the groups to present their reports to the "council" (the class). Encourage students to listen carefully to the presentations and list the precautionary measures they consider the best.

What If . . . ?
Have students do research on the Internet and use the Fujita Scale of Tornado Intensity to determine what would happen to their community should an F-5 tornado go through the main business district. They should assume the funnel of the tornado is 1/8 mile across, the tornado is moving at 60 miles per hour, and it is on the ground for six minutes.

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Suggested Readings

Caught in the Path: The Fury of a Tornado, the Rebirth of a Community
Carolyn Glenn Brewer [editor, interview compiler], Prairie Fugue Books, 1997
This compilation of oral histories captures the individual and collective experiences of members of one Kansas community who survived The Ruskin Heights Tornado of 1957.

In the Shadow of the Tornado: Stories and Adventures from the Heart of Storm Country
Richard Bedard, Gilco Publishers, 1996
This is a popular treatment of the experience of Oklahomans with tornadoes. Appropriate for young adult readers.

Twister: The Science of Tornadoes and the Making of an Adventure Movie
Keay Davidson, Pocket Books, 1996
This work presents a case study of the special problems of capturing and documenting dangerous weather phenomena for a commercially released major motion picture.

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Links

EBS TORNADO!
EBS TORNADO! links page.

Jose's Tornado
Computer animation of the formation of a tornado.

Tornado Myths
Myths about tornado safety that can get people killed. Safety is stressed in the dialogue. Links to historical pictures and current pictures.

The Central Ill. Severe Weather Outbreak—1996
One of the most memorable tornado outbreaks in Illinois history occurred on April 19, 1996. During the day, 33 tornadoes were reported as supercells erupted and moved across the state during the afternoon and evening hours.

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Vocabulary

Click on any of the vocabulary words below to hear them pronounced and used in a sentence.

 **Tornado Alley**

Definition: Area in the western United States from west Texas to the Dakotas known for its frequency of tornado strikes.
Context: West Texas to the Dakotas is called "Tornado Alley."

 **supercell**

Definition: Turbulent thunderclouds with strong updrafts of wind.
Context: In spring, humid air traveling north collides with cool, dry air traveling south. Where these air streams meet, huge supercell thunderclouds begin to build.

 **Doppler radar**

Definition: A radar system that utilizes the Doppler effect for measuring velocity.
Context: Doppler radar measures how fast an object, like a raindrop, is moving away from you. In effect, it is measuring wind speed.

 **wall cloud**

Definition: A wedge of slowly rotating clouds shaped like the base of a pyramid.
Context: A wedge of slowly rotating clouds shaped like the base of a pyramid descends. This is called a wall cloud.

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Standards

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 theMid-continent Research for Education and Learningin Aurora, Colorado.

Grade level: 6-8
Subject area: science
Standard:
understands basic features of the Earth.
Benchmarks:
Knows that when liquid water disappears, it turns into gas (vapor) in the air and can reappear as a liquid when cooled.

Grade level: 6-8
Subject area: science
Standard:
understands basic features of the Earth.
Benchmarks:
knows that clouds, which are formed by the condensation of water vapor, affect weather and climate; some do so by reflecting much of the sunlight that reaches Earth from the Sun; others hold heat energy emitted from the Earth's surface.

Grade level: 6-8
Subject area: science
Standard:
understands basic features of the Earth.
Benchmarks:
knows that the cycling of water in and out of the atmosphere plays an important role in determining climatic patterns: water evaporates from the surface of the Earth, rises and cools, condenses into rain or snow and falls to the surface where it forms rivers and lakes and collects in porous layers of rock.

Grade level: 6-8
Subject area: science
Standard:
understands basic features of the Earth.
Benchmarks:
knows the composition and structure of the Earth's atmosphere.

Grade level: 6-8
Subject area: science
Standard:
understands the interactions of science, technology and society.
Benchmarks:
knows that technology is essential to science because it enables observations of phenomena that are far beyond the capabilities of scientists due to factors such as distance, location, size and speed.

Grade level: 6-8
Subject area: science
Standard:
understands the interactions of science, technology and society.
Benchmarks:
knows that technological designs have constraints; some constraints are unavoidable (e.g., properties of materials, gravity, effects of weather and friction), and other constraints limit choices in the design (e.g., environmental protection, human safety, aesthetics).

Grade level: 6-8
Subject area: geography
Standard:
knows the physical processes that shape patterns on Earth's surface.
Benchmarks:
knows the consequences of a specific physical process operating on Earth's surface (e.g., effects of an extreme weather phenomenon such as a hurricane's impact on a coastal ecosystem; effects of heavy rainfall on hill slopes; effects of the continued movement of Earth's tectonic plates).

Grade level: 9-12
Subject area: Earth science
Standard:
understands basic features of the Earth.
Benchmarks:
knows the major external and internal sources of energy on Earth (e.g., the Sun is the major external source of energy; the decay of radioactive isotopes and gravitational energy from the Earth's original formation are primary sources of internal energy).

Grade level: 9-12
Subject area: Earth science
Standard:
understands basic features of the Earth.
Benchmarks:
knows that weather and climate involve the transfer of energy in and out of the atmosphere.

Grade level: 9-12
Subject area: Earth science
Standard:
understands basic features of the Earth.
Benchmarks:
knows how winds and ocean currents are produced on the Earth's surface (e.g., effects of unequal heating of the Earth's land masses, oceans, and air by the Sun; effects of gravitational forces acting on layers of different temperatures and densities in the oceans and air; effects of the rotation of the Earth).

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Credit

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