Earthquake Technology
STEM TRUNK

Students use K'Nex Building Sets to learn about earthquakes and earthquake technologies. They compare models to improve designs for a new building to be more earthquake resistant.

It's time to get shaking!

For more information on this trunk:

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DuPage Regional Office of EDUCATION
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EARTHQUAKE TECHNOLOGIES CHALLENGE GRADE LEVEL 3-5

OVERVIEW

Students use K'Nex Building Sets to learn about earthquakes and earthquake technologies. They compare models to improve designs for a new building to be more earthquake resistant.

MATERIALS AVAILABLE

Binder with Teacher guides and lessons
K'Nex Building Sets
Earthquake Technologies to test (cross-bracing, mass damper, and building shape materials)
Versa Timers
2 Wobble Shaker Tables

ACTIVITIES

If you want to use the Earthquake Technologies right away go to Tab1of this binder and read *STEP by STEP: Construct a 4-Story Building*. The complete Hand2Mind Teacher's Guide can be found in the bin along with Student Activity Books.

This guide serves as a quick reference and troubleshooting/FAQs to help you through this STEM activity.

MORE INFORMATION AND ACTIVITIES:

hand2mind https://www.hand2mind.com/

https://www.hand2mind.com/brands/hands-on-standards/hands-on-standards-stem-in-action/hands-on-standards-stem-in-action-earthquake-technologies-challenge

MORE IDEAS FOR STUDYING EARTHQUAKES:

https://kids.nationalgeographic.com/explore/science/earthquake/#earthquake-houses.jpg

https://geology.com/teacher/earthquake.shtml

ALIGNMENT TO STANDARDS

Next Generation Science Standards

Earth's Systems

4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.

Earth and Human Activity

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Engineering Design

3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Practices

Practice 2: Developing and Using Models
Practice 3: Planning and Carrying Out Investigations
Practice 6: Constructing Explanations and Designing Solutions
Practice 7: Engaging in Argument from Evidence

Crosscutting Concepts

Patterns
Cause and effect
Structure and function

Common Core Standards

http://www.corestandards.org/

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
CCSS.MATH.PRACTICE.MP4 Model with mathematics.
CCSS.MATH.PRACTICE.MP7 Look for and make use of structure.

International Society for Technology in Education Standards

https://www.iste.org/standards

ISTE.3d Knowledge Constructor Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

ISTE.4c Innovative Designer Students develop, test and refine prototypes as part of a cyclical design process.

ISTE.5b Computational Thinker Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

ISTE. 7d Global Collaborator Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.

Engineering Design Process

Engineering Design Process-define the problem, plan solutions, create and test models, reflect on and redesign the models based on what students learned.

Guide students to understand that an Engineering Design Problem is more like a puzzle to be solved than something that is bad or wrong.

Discussion Questions

Where/How can earthquakes occur?
Why are models used to represent the natural world?
What is affected in the event of an earthquake?
How did using the Engineering Design Process help you?
How did doing this activity make you feel like an engineer?

Assessment Ideas

1) Student explain their participation in the planning, building, and testing of a design solution.
2) Communication of the design of their model to classmates.
3) How they synthesize the information gained from this experience.

Real World Applications/Career Connections

Vibrations on a Global Scale
Practical Uses of Measurement/Mathematics
Earthquake Safety Technologies
Making Models to study Natural Disasters
Problem Solving

Students' career choices are many and widespread at this point in their lives. Now begins the time to guide the students about what careers entail by planning career development activities. Earthquake/Natural Disaster Careers: Geologist, Seismologist, Structural Engineer, Environmental Planner/Analyst, Computer Models and Simulations on Earthquakes

Earthquakes/Natural Disaster Resources

California Academy of Sciences www.calacademy.org
PBS Learning Media https://www.pbslearningmedia.org

USGS (United States Geological Survey)
https://earthquake.usgs.gov/learn/animations/
Weather Wiz Kids http://www.weatherwizkids.com/weather-earthquake.htm

HELPFUL TIPS FOR USING EARTHQUAKE TECHNOLOGIES

Each team begins with their own the 4-Story K'Nex Building. (Page 8-9 Student Book)
Make sure students join the correct rods to the correct connectors. (ex: yellow rods to gray connectors)
Instead of 2 or more technologies, give each team 1 technology to test.
(This introduces the idea that one **"variable"** is tested at a time)
If possible, have a sample 4-Story building already made for viewing.

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