Lesson Plan

Description

Safety is of utmost importance for engineers. Engineers use various forms of technology to ensure that structures are safe. This lesson will explore some of that technology and use a Micro :bit to show how structures can monitor for potentially hazardous amounts of force.

Learning Outcomes

- Buildings are designed and built with safety in mind
- Different tools can be used to ensure safety
- Goniometers measure angles
- Levels measure if objects are horizontal or vertical
- Seismometers measure movement in the ground

Specific Expectations

A2.1 write and execute code in investigations and when modelling concepts, with a focus on planning and designing programs
D1.1 evaluate environmental, social and economic factors that should be considered when designing and building structures to meet specific needs for individuals and communities
D2.7 describe methods engineers and other professionals use to assess, improve, and maintain the safety of structures

Introduction

Safety is the most important consideration when building various structures. Engineers, architects, technicians and many other professions place safety first when considering how a structure will be constructed. Professionals will follow established technological processes and monitor external conditions to ensure their designed structures stay safe. To assist with this, they have various tools to help ensure measure and monitor their projects. In this lesson are some of the tools used by professionals and they'll be replicated using a Micro:Bit.

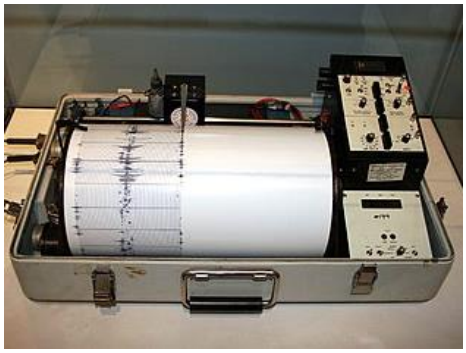
Goniometer

A goniometer is an instrument that either measures an angle or allows an object to be rotated to a precise angular position. The term goniometry derives from the Greek words for angle and measure. The first known use of a goniometer was by Gemma Frisius in 1538.

Bubble Level

A bubble level, spirit level, or simply a level, is an instrument designed to indicate whether a surface is horizontal (level) or vertical (plumb). Different types of levels may be used by carpenters, stonemasons, bricklayers, surveyors, millwright, and other trades workers, or in photography and video. A level's accuracy is dependent on its sensitivity. The sensitivity of a level can change depending on the type of level and what it's being used for.

Seismometer



A seismometer is an instrument that responds to ground noises and shaking such as that caused by earthquakes, volcanic eruptions, and explosions. They are usually combined with a timing device and a recording device to form a seismograph. The output of such a device is a seismogram. Data from a seismogram is typically used to locate and characterize earthquakes, and to study the Earth's internal structure.

A simple seismometer, sensitive to up-down motions of the Earth, is like a weight hanging from a spring, suspended from a frame that moves along with any motion detected. The relative motion between the weight and the frame provides a measurement of the vertical ground motion. A rotating drum is attached to the frame and a pen is attached to the weight, thus recording any ground motion in a seismogram.

Any movement from the ground moves the frame. The mass tends not to move because of its inertia, and by measuring the movement between the frame and the mass, the motion of the ground can be determined.

Materials

Here are the materials needed for this lesson plan:

- Computer or laptop
- Class-set of MicroBits

Action

1. Use the website https://makecode.microbit.org/ for coding the three different tools used by professionals when designing for safety.
2. Use the Coding Guide included with this lesson to guide students in creating programs with the Micro:Bit.
3. A presentation is included to help visualize the tools being used
4. If you want to teach the lesson remotely, use https://classroom.microbit.org/

Consolidation/Extension

- Use the tools created around the school. The goniometer can be used to measure angles or combined with Pythagorean theorem to measure for height. The level can be used to measure how close to horizontal and vertical different surfaces or objects are.

Accommodations/Modifications

- Break the lesson into multiple parts to allow time for students to complete the tasks
- Place students in groups to allow collaboration
- MakeCode has a virtual emulator if a class-set of Micro:Bits is not available.

Assessment

Teachers can monitor the student work as Assessment *for* Learning. Gather information from the students throughout the activity to gauge their level of understanding.