SCSU CCSA/CRISP Teacher Module Template 2016

Title: Breaking Point
Subject or Unit of Study Tensile Strength lab

GRADE LEVEL 7-10 **LENGTH OF DEMO/LESSON**: 1 class period

STUDENT OBJECTIVES

- Students will learn that materials can be strong in different ways (some will possess high tensile strength, some will be more elastic)
- Students will understand that scientist test the strength of materials by stressing them to the point of breaking

NEXT GENERATION SCIENCE STANDARDS

NGSS Performance Tasks	**MS-PS1-3 Matter and its Interactions** • Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. **HS-PS1-3 Matter and its Interactions** • Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
NGSS Disciplinary Core Ideas (DSI)	**MS - PS1.A: Structure and Properties of Matter** • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). **HS-PS1.A: Structure and Properties of Matter** • The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.
NGSS Cross Cutting Concepts (CCC)	**MS – CC 6 - Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. **HS CC1 - Patterns** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.
NGSS Science and Engineering Practices (SEP)	**MS SEP 8 - Obtaining, Evaluating, and Communicating Information** • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or now supported by evidence. **HS SEP 3 – Planning and Carrying out an investigation** • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

COMMON CORE STANDARDS

CC-ELA/Literacy Standards	**RST.6-8.1** • Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS1-3) **WHST.6-8.8** • Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-PS1-3) **RST.11-12.1** • Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-3) **WHST.9-12.7** • Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-3) **WHST.11-12.8** • Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS1-3) **WHST.9-12.9** • Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS1-3)
CC-Math	**HSN-Q.A.1** • Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-3) **HSN-Q.A.3** • Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-3)

MATERIALS

- 4 identical 5 gallon buckets
- 5 metal 'S' hooks
- 5 wooden dowels
- Cotton thread, size 35
- Kevlar filament thread size 46
- Nylon thread, size 46
- Kevlar fabric swatches
- Nylon fabric
- Steel picture-hanging wire, 28 gauge
- Vinyl electric tape
- Wire cutters
- Bullet proof vest
- *NOVA MakingStuffStronger*

Teacher will need to provide: Case of 24 water bottles(16.9 oz), unopened

SAFETY

- *Safety glasses & wipes*

LEARNER BACKGROUND

Students will have an understanding of the metric system, how to measure mass, how to write a procedure and how to graph before doing this lab. Definitions of the words strength, stress, tensile strength, elasticity, elongation and plastic are important as well.

LEARNING ACTIVITY OR PROCEDURE:

ASSESSMENT: Lab Report

ADDITIONAL RESOURCES: Making Stuff Stronger video

TEACHER NOTES: See Teacher Pages

Some advanced preparation needed