SCSU CRISP CCSA Kit Pages 2016

Title of Module: Exploring Properties: Capillary Action

Subject or Unit of Study: Materials, Properties of materials

GRADE LEVEL 5 - 9 **LENGTH OF DEMO/LESSON**: _____

STUDENT OBJECTIVES

Students will...

- At the nanoscale things behave in surprising ways.
- Technologies and society influence each other.

STANDARDS

Next Generation Science Standards

NGSS Performance Tasks	**5-PS1-1** • Develop a model to describe that matter is made of particles too small to be seen **MS-ETS1-1 Engineering Design** • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **HS-ETS1-1 Engineering Design** • Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
NGSS Disciplinary Core Ideas (DSI)	**MS - ETS1.A: Defining and Delimiting Engineering Problems** • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. **HS - ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
NGSS Cross Cutting Concepts (CC)	**Interdependence of Science, Engineering, and Technology** • All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS) • The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by

	differences in such factors as climate, natural resources, and economic conditions. (MS) • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS)
NGSS Science and Engineering Practices (SEP)	**SEP 1 - Asking Questions and Defining Problems** • Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.(MS) • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.(HS) **SEP 2 – Developing and Using Models** • Use models to describe phenomena.

Common Core Standards

CC-ELA/Literacy Standards	**RST.6-8.1** • Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1) **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-ETS1-1) **RST.11-12.7** • Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ETS1-1) **RST.11-12.9** • Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. (HS-ETS1-1)
CC-Math	

MATERIALS

List all materials needed for this lesson/demonstration

- Filters
- Water-soluble markers
- Squeeze bottle of water
- Lab-on-a-chip & paper diagnostics sheet
- Acrylic capillary action setup (two acrylic squares, binder clip, paper clip, petri dish, food coloring)
- Paper towels (optional for cleanup)

SAFETY

Students should not drink the colored water

LEARNING ACTIVITY OR PROCEDURE:
See the NanoDays activity Guide

ADDITIONAL RESOURCES:
NanoDays Website:

http://www.nisenet.org/catalog/exploring-properties-capillary-action-nanodays-2014

TEACHER NOTES:

Timing: It may take a few moments for the liquid to rise up between the acrylic squares. Do the coffee filter activity first and come back to the demo afterwards to see how much the water moved.

STEM CAREERS: