

**HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

**Related prior knowledge**

ESS2.C: Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b>  <i>Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.</i>            * 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. (HS-ESS2-5)</p>	<p><b>ESS2.C: The Roles of Water in Earth's Surface Processes</b>            * The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5)</p>	<p><b>Structure and Function</b>            * The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)</p>
Objectives	Classroom Activities	Assessments
Students will be able to explain the chemical reaction between acid rain and limestone.	Students will read through background information to hypothesize how a sinkhole occurred in April in Chicago.	Students will create a physical model of a sinkhole that includes a reference sheet for each component.
Students will be able to use a computational model to determine the feasibility of their model.	Students will analyze pictures to determine the affects of acid rain on building materials.	Students will test their model and make adjustments.
Students will be able to define a sinkhole and explain how it occurs.	Students will be building a model to show how a sinkhole might form from a box of materials.	<b>Summative: Students will present their work to the class.</b>
Students will be able to create a model of a sinkhole using lab materials.	Students will utilize a computational model in NetLogo to trouble shoot their physical model.	
Students will create and test a model that represents water's ability to transform the earth through dissolving limestone bedrock to form sinkholes.	Students will present their model to the classmates for evaluation.	