

RIVERS

Rivers Instructional Case: A series of student-centered science lessons

Authors

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Reference to this instructional case should include the following citation: Seitz, O'Connor, and DiStefano (in prep).

Overview

The Rivers Instructional Case is a curriculum consisting of four lessons that can be used to supplement a broader unit on erosion. The rivers instructional case advances students' qualitative understanding of how rivers modify and shape the Earth's surface while explicitly providing opportunities for students to develop their science practices. Through this instructional case, students will develop an understanding of the how rivers transport (erosion) and deposit (e.g., point bars) sediment and evolve over time (e.g., meanders and oxbow lakes). Through hands on activities, students will gain an understanding of how water velocity (gradient) may affect the shape of the river and observe the surface features that result. Scientific misconceptions such as the mistaken idea that rivers are static (do not change over time) rather than dynamic environments that can change rapidly are addressed. Each lesson contains references to the relevant *Next Generation Science Standards* and the *Common Core State Standards* and is a way to shift teachers' classroom practices to utilize the science and engineering practices.

Lesson 1: The real life application of which side of the river should you build your house on stimulates students' interest in the erosion and deposition of sediment that may modify the landscape. Students get an introduction to how moving water may modify the surface of the Earth. The assessment probe seeks to guide instruction to address misconceptions and gaps in the understanding of river erosion and deposition. Students will utilize the Question Formulation Technique where students will be generating investigable questions on the subject matter. The probe will serve as a continuum of learning as students' progress through the entire instructional case.



Yukon River Source: USGS

Lesson 2: Students will be given a sediment tube to begin to investigate the deposition of sediments in an aqueous environment. First, students will be asked to make predictions about how sediment will be deposited after the tube is shaken vigorously. They will make several short duplicate observations (to confirm their results) and a longer-term experiment to observe the settling of finer sediment. Students will record their observations and use this evidence to construct explanations about the role of energy in the deposition of sediments in a river.

Lesson 3: A vocabulary card sort introduces the geologic features they may observe in a stream table lab. Students will reinforce the vocabulary learned in the previous lessons by participating in a card sort using vocabulary and picture cards. The card sort will further be emphasized using direct instruction coupled with student-to-student discourse embedded within the online lectures. Students will be using the “Quiz Quiz Trade” Protocol as a formative assessment to culminate the instructional case.

Lesson 4: Students experience a model of a stream table to form an understanding of the different variables that can shape a river and its surroundings. Students will use the stream table to investigate the formation and evolution of rivers, the erosion of sediments as a function of flow rate and stream gradient, and consider how rivers continually modify the landscape. The stream table serves as a model for observing the patterns of erosion in river environments. Students will have the opportunity to revise the model of the stream table and evaluate the limitations of this model versus an actual river.