

# Constructivism and the Five E's

BSCS, the Biological Sciences Curriculum Study ( <http://www.BSCS.org/> ), is a nonprofit organization that develops science curricula for grades K-college and provides professional development opportunities for science teachers at all levels. BSCS was one of several research-based curriculum groups created by grants from the National Science Foundation. BSCS develops curricula that allow students to learn science by doing science, and is recognized for its leadership in the development of science programs at the secondary level that have had an enduring effect on the teaching of biology.

Many of the programs developed by BSCS use an instructional model characterized by the 5 E's: engage, explore, explain, elaborate and evaluate. Each E represents part of the process of helping students sequence their learning experiences to construct their understanding of concepts.

**Engage.** First, students are engaged by an event or question related to the concept that the teacher plans to introduce. They make connections between past and present learning experiences and lay the groundwork for activities to follow. Asking a question, defining a problem or showing a surprising event are all ways to engage students and focus them on the instructional task.

**Explore.** Then the students participate in one or more activities to explore the concept. They have the opportunity to get directly involved with phenomena and materials. This exploration provides students with a common set of experiences which assists them in sharing and communicating and from which they can initiate the development of their understanding. The teacher acts as a facilitator, providing materials and guiding the students' focus. The students' inquiry drives the instruction during an exploration.

**Explain.** In the explain phase, the teacher clarifies the concept and defines relevant vocabulary so that the students can put their exploratory experiences into a communicable form. Common language enhances the sharing and communication between teachers and students. Introducing labels after students have had a direct experience is far more meaningful than presenting the terms before the experience.

**Elaborate.** Then the students elaborate and build on their understanding of the concept by applying it to new situations and making connections to other related concepts. These investigations often lead to further inquiry and new understandings.

**Evaluate.** Finally, the students complete activities that will help them and the teacher evaluate their understanding of the concept. This is an on-going diagnostic process that allows the teacher to determine if the learner has attained understanding. Evaluation serves as a guide to the teacher in further planning. For example, if the teacher perceives evidence of misconceptions, the activities and concepts can be revisited to enhance clearer understanding. If the students show interest in a branching direction of inquiry, the teacher can consider refocusing the investigation to take advantage of that interest. Viewing the evaluation process as a continuous one gives this model a cyclical structure, where questions lead to answers and more questions.