TECHNOLOGY in Practice
Applications and Innovations

The BSCS 5E Instructional Model

The activities in each chapter have been sequenced according to an instructional model based on the findings in *How People Learn* (NRC, 2000) and the constructivist philosophy of learning (Trowbridge, Bybee, & Powell, 2004). One tenet of the constructivist philosophy is that we all have experiences from which we build, or construct, knowledge. Yet, in a classroom, attempting to help each student construct knowledge based on his or her previous experiences can be a daunting task. The BSCS 5E Instructional Model provides a solution to this challenge.

The BSCS 5E Instructional Model is characterized by the following phases. Each chapter goes through a cycle of activities and each activity exemplifies one of the "E" words.

Engage: The students are engaged by an event or question related to the major concept in the chapter. This stage is meant to help students begin thinking about what they will learn.

Explore: The students participate in a common set of experiences from which they can initiate the development of their understanding of the concept.

Explain: Students build their explanation of a major idea. The teacher may clarify the concept and encourage students to use relevant terms, but is not lecturing to students to explain the concept.

Elaborate: The students build on their understanding of the concept by applying it to new situations.

Evaluate: The students complete an activity that will help both the students and the teacher evaluate student understanding of the concept.

Each phase of the instructional model is characterized by certain features. The two tables below summarize features that are consistent and inconsistent with the model. The first table shows what the teacher does during each phase and the second table shows what students do during each phase of the model.

TABLE 1

Stages of the BSCS 5E Instructional Model

Stage	What the Teacher does that is … consistent with this model.	What the Teacher does that is … inconsistent with this model.
Engage	▪ Creates interest ▪ Generates curiosity ▪ Raises questions ▪ Elicits responses that uncover what the students know or think about the concept / topic	▪ Explains concepts ▪ Provides definitions and answers ▪ States conclusions ▪ Provides closure ▪ Lectures
Explore	▪ Encourages the students to work together without direct instruction from the teacher ▪ Observes and listens to the students as they interact ▪ Asks probing questions to redirect the students' investigations when necessary. ▪ Provides time for the students to puzzle through problems ▪ Acts as a consultant for students	▪ Provides answers ▪ Tells or explains how to work through the problem ▪ Provides closure ▪ Tells the students that they are wrong. ▪ Gives information or facts that solve the problem ▪ Leads the students step-by-step to a solution
Explain	▪ Encourages the students to explain concepts and definitions in their own words ▪ Asks for justification (evidence) and clarification from students ▪ Formally provides definitions, explanations, and new labels ▪ Uses students' previous experiences as basis for explaining concepts	▪ Accepts explanations that have no justification ▪ Neglects to solicit the students' explanations ▪ Introduces unrelated concepts or skill
Elaborate	▪ Expects the students to use formal labels, definitions, and explanations provided previously ▪ Encourages the students to apply or extend the concepts and skills in new situations ▪ Reminds the students of alternate explanations ▪ Refers the students to existing data and evidence and asks: What do you already know? Why do you think …? (Strategies from Explore apply here also.)	▪ Provides definitive answers ▪ Tells the students that they are wrong ▪ Lectures ▪ Leads students step-by-step to a solution ▪ Explains how to work through the problem
Evaluate	▪ Observes the students as they apply new concepts and skills ▪ Assesses students' knowledge and/or skills ▪ Looks for evidence that the students have changed their thinking or behaviors ▪ Allows students to assess their own learning and group-process skills ▪ Asks open-ended questions such as, Why do you think …? What evidence do you have? What do you know about x? How would you explain x?	▪ Tests vocabulary words, terms, and isolated facts ▪ Introduces new ideas or concepts. ▪ Creates ambiguity ▪ Promotes open-ended discussion unrelated to the concept or skill

TABLE 2

Stages of the BSCS 5E Instructional Model

Stage	What the Student does that is … consistent with this model.	What the Student does that is … inconsistent with this model.
Engage	▪ Asks questions, such as Why did this happen? What do I already know about this? What can I find out about this? ▪ Shows interest in the topic	▪ Asks for the "right" answer ▪ Offers the "right" answer ▪ Insists on answers or explanations ▪ Seeks one solution
Explore	▪ Thinks freely, but within the limits of the activity ▪ Tests predictions and hypotheses ▪ Forms new predictions and hypotheses ▪ Tries alternatives and discusses them with others ▪ Records observations and ideas ▪ Suspends judgment	▪ Lets others do the thinking and exploring (passive involvement) ▪ Works quietly with little or no interaction with others (only appropriate when exploring ideas or feelings) ▪ "Plays around" indiscriminately with no goal in mind ▪ Stops with one solution
Explain	▪ Explains possible solutions or answers to others ▪ Listens critically to others' explanations ▪ Questions others' explanations ▪ Listens to and tries to comprehend explanations that the teacher offers ▪ Refers to previous activities ▪ Uses recorded observations in explanations	▪ Proposes explanations from "thin air" with no relationship to previous experiences ▪ Brings up irrelevant experiences and examples ▪ Accepts explanations without justification ▪ Does not attend to other plausible explanations
Elaborate	▪ Applies new labels, definitions, explanations, and skills in new but similar situations ▪ Uses previous information to ask questions, propose solutions, make decisions, and design experiments ▪ Draws reasonable conclusions from evidence ▪ Records observations and explanations ▪ Checks for understanding among peers	▪ "Plays around" with no goal in mind ▪ Ignores previous information or evidence ▪ Draws conclusions from "thin air" ▪ In discussion, uses only those labels that the teacher provided
Evaluate	▪ Answers open-ended questions by using observations, evidence, and previously accepted explanations ▪ Demonstrates an understanding or knowledge of the concept or skill ▪ Evaluates his or her own progress and knowledge ▪ Asks related questions that would encourage future investigations	▪ Draws conclusions, not using evidence or previously accepted explanations ▪ Offers only yes-or-no answers and memorized definitions or explanations as answers ▪ Fails to express satisfactory explanations in his or her own words ▪ Introduces new, irrelevant topics

References

National Research Council (NRC). (2000). *How people learn*. Washington, DC: National Academy Press.

Trowbridge, L., Bybee, R., & Powell, J.C. (2004). *Teaching secondary school science: Strategies for developing scientific literacy*. Columbus, OH: Merrill/Prentice Hall.