

# 5E Learning Model

## History of 5E Model

The 5E Model, originally credited to Karplus & Their (The Science Teacher, 1967) and later modified by Roger Bybee for the Biological Science Curriculum Study (BSCS) project, proposes that learning something new, or understanding something familiar in greater depth, involves making sense of both our prior experiences and first-hand knowledge gained from new explorations. Each of the five stages builds upon previous as students construct new understanding and develop new skills. Versions of the 5E model are present in the major science curricula today (FOSS, BSCS, STC, etc.)

## Engage:

- Initiates the learning task.
- Introduces the major ideas of science in problem situations.
- Make connections between the past and present learning experiences.
- Focuses student thinking on the learning outcomes of the upcoming activities.
- Mentally engages students in the concept to be explored.
- Motivates students.

In the engage phase, students encounter a scientific question, idea, or natural phenomenon. Teachers might introduce a unit with a field trip, demonstration, or discrepant event, a problem to solve, a current event, a local issue, a discussion, or some other strategy to engage students' attention and get them thinking about the questions they will encounter in the unit.

Assessment purposes for the engage phase are for teachers to:

- Identify students' incoming science ideas and misconceptions.
- Determine what students need to explore in the next phase.

Assessment strategies for engage phase: KWL chart, concept mapping, card sort task, memoir, brainstorming, interview, questionnaire, Venn diagram, STEM notebook, predicting, team meeting, and observation.

## Explore

- Provides opportunities for students to test their ideas against new experiences.
- Provides opportunities for students to compare their ideas with ideas of their peers and teacher.
- Provides a common base of experiences in which students actively explore their environment or manipulate materials.

During the explore phase, students have firsthand experience with a phenomenon. They might carry out investigations using laboratory equipment,

make observations in nature, or collect data using the Internet. Often students work in teams to build a common base of experience about the phenomenon under study.

Assessment purposes for the explore phase are for teacher to:

- Determine how students are progressing in their conceptual understanding.
- Understand what students do not understand and determine instructional interventions that need to occur.

Assessment strategies for the explore phase: STEM notebook, conceptual cartoon, think-pair-share, drawing completion, predicting, demo memo, team meeting, chart, and observation.

## **Explain**

- Provide opportunities for students to develop explanations.
- Introduces formal language, scientific terms, and content information to make students' previous experiences easier to describe and explain.

The purpose of the explain phase is for students to formalize their understanding of the concepts under investigations. Students invent explanations and use evidence from the explore phase to support their ideas. Teachers introduce formal ways to represent these ideas— terms, formulas, diagrams, and so on.

Assessment purposes for the explain phase are:

- For students to demonstrate their current understanding.
- For teacher to determine what ideas need further instructional attention.

Assessment strategies for the explain phase: exit ticket, discrepant event, concept test, making a model, making a claim, meaningful paragraph, STEM notebook, KWL chart, labeled drawing, predicting, letter to teacher.

## **Elaborate**

- Applies or extends students' developing concepts in new contexts.
- Provides opportunities for students to develop deeper and broader understanding.

In the elaborate phase, students build on their understanding by solving new problems in new contexts. Teachers design ways for student to extend what they know by transferring their understanding to these problems.

Assessment purposes for the elaborate phase are:

- For students to demonstrate their ability to apply and transfer their understanding to new contexts.
- For teachers to see how students use formal representations of STEM knowledge (terms, formulas, diagrams).

Assessment strategies for the elaborate phase: application problem, pair problem solving, puzzlers, thought experiment, debate, writing and analyzing fiction, design activity, STEM notebook, identification game, team report, data table and graph, predicting.

## **Evaluate**

- Encourages students to assess their understanding as they apply what they know to solve problems.

The evaluate phase provides opportunities for students to reflect on and demonstrate what they know. Students communicate their learning to various audiences.

Assessment purposes for the evaluate phase are:

- For teachers to determine what students learned from the unit.
- For students to be metacognitive about their learning.

Assessment strategies for the evaluate phase: poster, constructed response, presentation, comparison essay, final reflection, self-evaluation, one-page memo, scenario exam, concept mapping, Venn diagram, and STEM notebook.