The 5 E's Instructional Model

Phase of the Instructional Model	Teacher Does	Student Does
ENGAGE Initiates the learning task. The activity should make connections between past and present learning experience, and anticipate activities and organize students' thinking toward the learning outcomes and current activities.	• creates interest • generates curiosity • raises questions and problems • elicits responses that uncover students' current knowledge about the concept/topic	• asks questions such as, Why did this happen? What do I already know about this? What can I find out about this? How can this problem be solved? • shows interest in the topic.
EXPLORE Provide students with a common base of experiences within which current concepts, processes, and skills are identified and developed.	• encourages students to work together without direct instruction from the teacher. • observes and listens to students as they interact. • asks probing questions to redirect students' investigations when necessary. • provides time for students to puzzle through problems. • act as a consultant for students	• thinks creatively within the limits of the activity • tests predictions and hypotheses • forms new predictions and hypotheses • tries alternatives to solve a problem and discusses them with others • records observations and ideas • suspends judgment • tests ideas
EXPLAIN Focus student's attention on a particular aspect of their engagement and exploration experiences, and provide opportunities to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to introduce a concept, process, or skill.	♦ encourages students to explain concepts and definitions in their own words. • asks for justification (evidence) and clarification from students • formally provides definitions, explanations, and new vocabulary • uses students' previous experiences as the basis for explaining concepts	• explains possible solutions or answers to other students • listens critically to other students' explanations • questions other students' explanations • listens to and tries to comprehend explanations offered by the teacher • refers to previous activities

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ELABORATE Challenge and extend students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills.	• expects students to use vocabulary, definitions, and explanations provided previously in new context • encourage students to apply the concepts and skills in new situations • remind students of alternative explanations • refers students to alternative explanations	• applies new labels, definitions, explanations, and skills in new, but similar, situations • uses previous information to ask questions, propose solutions, make decisions, design experiments • draws reasonable conclusions from evidence • records observations and explanations
EVALUATE Encourage students to assess their understanding and abilities and provide opportunities for teachers to evaluate student progress.	• refers students to existing data and evidence and asks, "What do you already know?" Why do you think …? • observes students as they apply new concepts and skills • assesses students' knowledge and/or skills • looks for evidence that students have changed their thinking • allows students to assess their 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 the problem? How would you answer the question?	• checks for understanding among peers • 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

Science Education in California

What resources are used/available in each of these areas?

Curriculum

Instruction

Student Understanding

Assessment
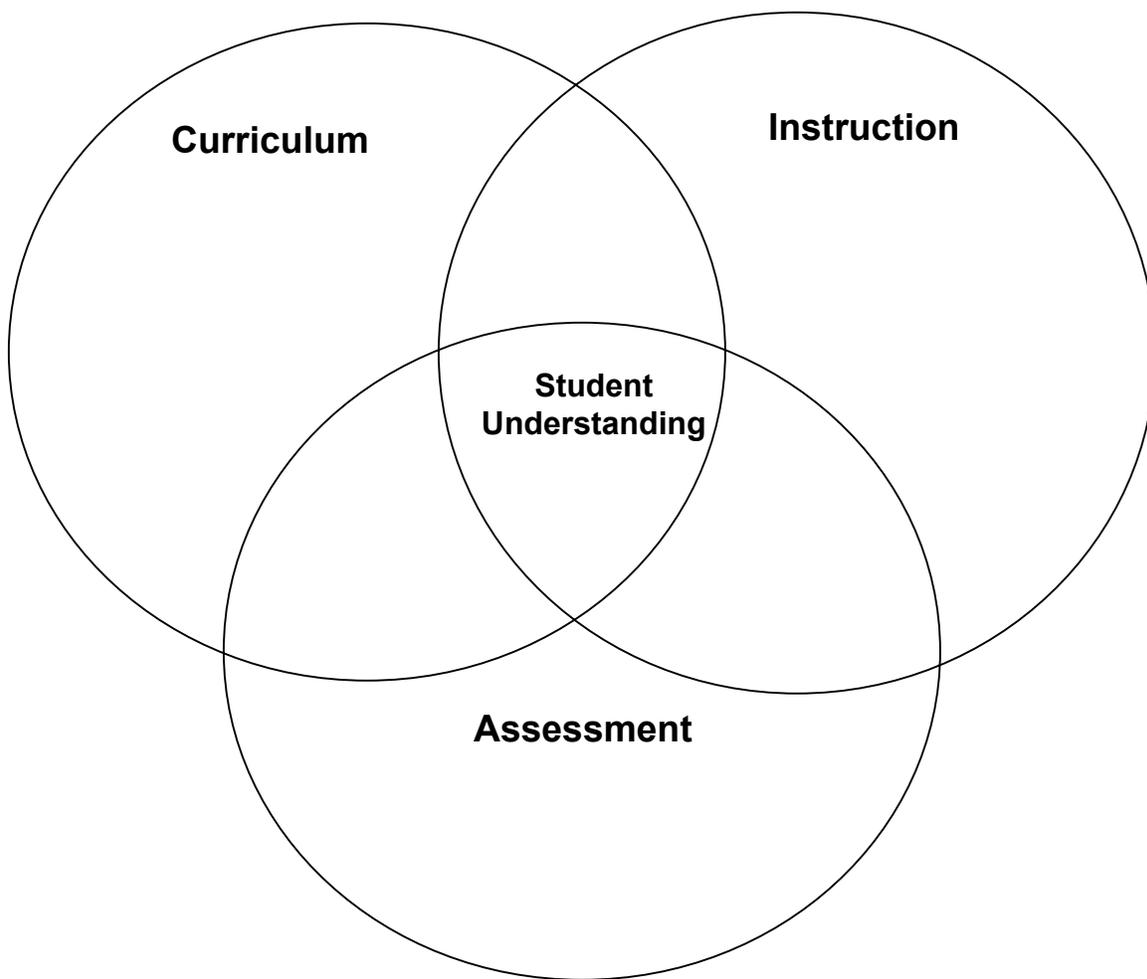
Additional Concept Statements from the Science Standards

- Electric and magnetic phenomena are related and have many practical applications.(Physics #5)

- The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.(Chemistry #3)

- Energy is exchanged or transformed in all chemical reactions and physical changes of matter. (Chemistry #7)

- The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes, and chemical properties and provide the biochemical basis of life. (Chemistry #10)

- Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time. (Earth #1)

- Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life. (Earth #8)

- As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. (Biol/Life #9)

- A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. (Biol/Life #3)

Reflection Questions

How will this session's information and issues that arose assist you in your work as a Key Leader and as an advocate for science?

What issues around the CA Science Standards come to mind? What could you do - at your school, district, county, or state level - to advocate for:

- More science education in all CA schools.

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- Supportive state policies for science education.

- Local support for science education.