

STRATEGIES FOR HELPING STUDENTS BUILD ON THEIR IDEAS

Avoid Show & Tell. Let go of the belief that if you simply tell students stuff they will learn what you tell them.

- Use real-world investigations & materials, involving observation & exploration.
- Make use of models, but be aware of and discuss their limitations.

Use Learning Cycle-based Instruction. Situate learning experiences within the learning cycle: invitation, exploration, concept invention, application, reflection.

- Provide learning experiences in which students explore, become curious, discover, struggle with new ideas, make connections, etc.
- Tell information strategically (in small bits, usually only what students aren't likely to discover on their own, at just the right moments when they're interested to hear it).
- Set up learning situations where students need to grapple with conflicting ideas & alternate conceptions.

Do More Deep & Sticky Learning and Less Shallow and Slippery Learning: longer episodes with students struggling with ideas and fewer short episodes with telling, memorizing, regurgitating

- Provide multiple opportunities for meaningful conceptual learning.
- Focus on reasoning, comprehension, and depth, less on memorization of information.
- Give students opportunities to think, re-think, discuss, reflect, and apply their ideas to new situations. It takes time to construct new concepts.
- Provide evidence that shows why a certain explanation is "correct," AND provide opportunities and evidence for students to see why other explanations are inaccurate.

Avoid Canned Spiels. Ask the students to make sense of their experiences. What does it remind you of? What does it look like to you? Have you heard of anything like that before?

- Use what you learn about student's ideas to inform your teaching.
- Be flexible and adapt your instruction to be relevant and responsive to student needs.

Broad Questions and Listening. Ask lots of interesting broad questions, and listen to students' ideas.

- Cultivate a learning environment that celebrates good thinking and struggling with evidence-based explanations, more than "knowing the right answer."
- Find out what students already think, elicit their prior ideas.

Student Discourse. Give students lots of opportunities to talk to one another and to you about science ideas

- Facilitate open discussion of alternative ideas.
- Provide ways for students to represent their ideas (peer-to-peer discussion, whole group discussion, drawing, writing)
- Help students struggle with multiple perspectives and ideas to build their own more complete understanding.