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Please enjoy these complimentary teaching strategies from *Developing Expert Learners* by Michael McDowell. Use these strategies to present misconceptions, paradoxes, metaphors, and different models to evoke dissonance in students and test and challenge their prior knowledge.

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Testing and Challenging Prior Knowledge

When I'm stuck I . . .

When students are faced with information that is (a) brand new or (b) conflicting with prior ideas, they are more likely to be engaged in the content and, simultaneously, get stuck in their learning. They may lose confidence.

Step 1: Present misconceptions, paradoxes, metaphors, and different models to evoke dissonance in students understanding.

Step 2: Ask students to

- Write down how they feel
- What they will do to solve the problem that is presented to them
- Describe how they will maintain a level of optimism and confidence in their learning

Examples of misconceptions, paradoxes, metaphors, and models that you can present to your students include the following:

Cognitive Challenge Themes	Examples	Strategy to Progress
Paradoxes— <i>A contradictory statement that is true</i>	<ul style="list-style-type: none"> • The paradox of creativity is that the making of something new brings with it the destruction of something old. • Stealing is bad. Robin Hood is good. 	<ul style="list-style-type: none"> • Frame situations in both/and vs. either/or. • Test assumptions and inferences to understand relationships between and among ideas.
Metaphor— <i>An approach to articulating a challenging idea simply</i>	<ul style="list-style-type: none"> • Students are told that the way in which cells work is much like how a city is run. • Students are told that one way to understand fractions is to cut a pizza. 	<ul style="list-style-type: none"> • Test assumptions and inferences to understand the strengths and limitations of the metaphor. • Compare and contrast other metaphors. • Show students the content outside of the context.
General Models— <i>A way to articulate an idea or skill</i>	<ul style="list-style-type: none"> • Students are tasked with creating a model of DNA. • Students are tasked with developing a graph and ignoring certain variables. 	<ul style="list-style-type: none"> • Test assumptions and inferences to understand the strengths and limitations of the metaphor. • Compare and contrast other metaphors. • Show students the content outside of the context. • Discuss with students limitations.
Misconceptions— <i>A misunderstanding of a concept or skill</i>	<ul style="list-style-type: none"> • Students see a student shooting a basketball and believe that more than one force is acting on the ball (assuming air resistance is a constant). 	<ul style="list-style-type: none"> • Ask students to write down what they think they know and then test that knowledge after they receive new information. • Show students incorrect and correct examples and discuss the differences.
Perceived biases— <i>A persistent belief that has not been challenged by factual evidence</i>	<ul style="list-style-type: none"> • Students accept a stereotype of a particular subgroup or of themselves. 	<ul style="list-style-type: none"> • Test assumptions and inferences to understand the intent behind such biases. • Provide concrete examples for challenging biases. • Provide examples for how perceived biases perpetuate (discuss limitations).