

GENERAL PRACTICES FOR USING EMBEDDED ASSESSMENT TO IMPROVE TEACHING AND LEARNING

(Assessing for learning should be indistinguishable from good teaching!)

Be curious about student ideas.

- Ask broad questions, give students multiple opportunities to discuss ideas, take advantage of opportunities such as *Walk & Talk* to listen to individual students, listen in on discussions and notice what students write. Encourage students to share with the group and with one another and listen to their ideas. Use your observation and inquiry skills to investigate how students develop understandings.
- Interview individual students about their ideas whenever you get a chance. One easy place to do this is during *Walk & Talk* and *Turn & Talk* activities.
- Ask probing follow-up questions. Ask students to expand on and explain their thinking. Ask, “What do you mean by that? What makes you think that?” Try to find out their reasoning.
- When students say or write “weird” ideas, ask probing follow-up questions to try to understand where they’re coming from. What is the useful information or reasoning they’re using? What might be leading them to inaccuracies?
- Find out what students know before you begin. Accessing prior knowledge helps students connect what they’re learning to previous experiences. It also helps the instructor build on existing student ideas.
- Record student talk and behavior during activities. Jot down notes as students work in small groups. (Index cards can be handy for this.) Are there any patterns you notice? Are there common things with which your students are struggling? Can you identify any misconceptions or inaccurate ideas?

Have a variety of activities from which to choose.

- Get a series of activities on a concept (such as adaptation) under your belt and then think about and keep track of what each one offers students.
- Carry these with you and be prepared to decide which to use, depending on your assessment of where your students are at.
- See the BEETLES *Ecosystems (and Matter) Theme Hike* and *Adaptations, Structure, and Function Theme Hike* for ideas on planning progressions of activities.

Be informed about common misconceptions.

- Familiarity with common misconceptions will help you recognize them when students bring them up and can help you plan experiences to shift students’ understanding.
- Read up on common misconceptions about concepts and ideas you’re teaching. These are included in BEETLES student activity write-ups as Common Relevant Misconceptions in the Instructor Support section. They can also be researched online (e.g., Google “misconceptions research photosynthesis”).
- When students share inaccurate ideas, try to come up with evidence/experiences that confront these ideas and help students see for themselves what’s inaccurate about their ideas. Then, they can revise their ideas, which will add to their understanding.

Think about the conceptual flow for a topic you're teaching..

- Become intrigued with the conceptual flow of an area of content.
- Become actively curious about how students develop understanding of the concepts (i.e., What's a logical conceptual flow for building this understanding?).
- What are the foundational ideas students need to understand and what are the steps that go deeper?
- See the BEETLES guide, *Creating Effective Outdoor Science Activities*, pages 56–65. This section breaks down different important science concepts into an order of what students should learn about a concept and what they should understand during different grade bands. It also includes recommendations about where to focus efforts on each concept in outdoor science.

Focus on building science practices.

- Be curious about students' abilities with science practices. Pay attention to students' behaviors. At least as important as assessing conceptual understanding is assessing students' abilities to make observations, ask questions, make explanations, argue from evidence, discuss ideas with others, etc.
- Become intrigued with the progression for building students' science practices.
- What practices do students need to begin investigating the world and discussing ideas with on another? What are the steps that go deeper?
- See the BEETLES guide, *Creating Effective Outdoor Science Activities*, pages 66–74. This section includes descriptions of practices and examples of how to teach these in the field.

Explore students' "weird" ideas.

- When students say or write "weird" ideas, ask probing follow-up questions to try to understand where they're coming from.
- What is the useful information or reasoning they're using?
- What might be leading them to inaccuracies?

Adjust your teaching.

- Once you've uncovered some of what students are thinking and doing, you can make changes to the questions you ask and adjust activities and discussions accordingly
- If you notice that students seem weak on a concept, you might do more with it. If students show evidence of understanding, you can take them to the next level. If students arrive with little ability to discuss ideas, focus on paired discussions and listening skills. If students arrive further along with these abilities, you can take them further in their skills.

Find out what students have learned during your instruction.

- Challenge students to apply what they've learned and push them beyond just recalling facts.
- Ask them how they might explain something they've learned to another student, using their own words.
- Lead a debrief discussion with the whole group and watch their behaviors to see what they can tell you about exploration skills, discussion skills, etc. that they've learned.

Use these steps of the Reflective Teaching cycle::

- **Set a teaching goal.** First, set a specific teaching goal for your activity or field experience, such as leading a concept-based discussion that helps students build on one another's ideas.
- **Teach what you planned to teach.**
- **Take notes.** Jot down brief notes as students are talking, trying to capture some of what comes up during discussion.
- **Reflect on how it went.** Afterward, sit down (ideally with a colleague) and explore what students were doing and what this might mean for your teaching. Are there any patterns? What do you want or expect to see your students do differently? What can you do to make this happen?
- **Adjust goals and teaching.** Use what you've learned to make adjustments to improve your instruction.
- Use this cycle over and over to build expertise in instruction and assessment.