Assessment in *Carbon TIME*

The *Carbon TIME* Process Tools and pre/post tests are designed with formative and summative assessment in mind, and have three major purposes:

1. *Grading and Accountability*
2. *Insight* into students' knowledge and practices, both for the teacher and the classroom community
3. *Student self-assessment,* so that students understand and clarify their own thinking, which is requisite for conceptual learning and figuring out phenomena

Grading & Accountability

Grading provides a means of communicating with students about *what matters* in *the* classroom: What they are accountable for, and why their talk and writing is important. *Carbon TIME* has supports for this assessment purpose throughout each unit.

1. *Students as questioners and investigators.*
    a. Expressing Ideas and Predictions Tools – students are accountable for articulating their initial ideas, for listening and responding to others' ideas and questions, and for returning to earlier ideas later in the unit and noticing how ideas have changed.
    b. Evidence-Based Arguments Tool – students are held accountable for key evidence, arguments, and unanswered questions by the end of the lesson
    c. Assessment documents provide Learning Progression level guidance.
2. *Explanations Tools and general explanations lessons: Students as explainers.*
    a. The Three Questions provide a 4-step guide and general rubric for explaining phenomena, which can be used as a self-assessment and revision guide
    b. Grading documents provide scoring and Learning Progression level guidance
3. *Carbon TIME* post-tests
    a. Computer scoring of forced choice responses and downloadable, editable spreadsheets of class results (with tutorials) are available.
    b. Grading documents provide scoring and Learning Progression level guidance.

Insight into Student Knowledge and Practice

Carbon TIME materials are designed to enable productive classroom discourse, in which talk, writing, and norms of interaction support figuring out phenomena. Process Tools and pre- and post-assessments are designed, in part, to elicit *interesting wrong answers*. That is, the questions aim to reveal how students are thinking even if they don't fully understand the science. The Assessing and Grading documents highlight common patterns in students' ideas to help teachers begin to identify these patterns in their own classroom. Additionally, discussing the various ideas that exist in the classroom fosters shared curiosity and supports individual students in better understanding their own thinking.

Student Self-assessment

Students are often not aware of their own prior knowledge and preconceptions. In order for effective learning to occur, student must be given opportunities to articulate these ideas and compare them to the scientific explanations they learn through classroom activities. In addition, throughout a unit, students need to be able to assess the quality of their arguments and explanations, in order to improve them. The Three Questions, the *Carbon TIME* discourse routines, and shared checklists and rubrics are all designed to involve students in assessing their own thinking and writing. We have found that having students revisit earlier tools helps them to identify how their thinking has changed over the course of a unit.

Designed Purposes of *Carbon TIME* Assessment Tools and their Discourse Routines

ASSESSMENT PURPOSE	Pretest	Expressing Ideas Tool	Predictions Tool	Evidence-Based Arguments Tool	Explanations Tool	General Explanations	Posttest
Grading & Accountability	Flexible Accountability: Students may use content, practices, and Three Questions from previous units to constrain/guide their thinking.	Some Accountability: Students may use content, practices, and Three Questions from previous units to constrain their thinking and guide/challenge the thinking of others.	Some Accountability: Students may use content, practices, and Three Questions from previous units to constrain their thinking and guide/challenge the thinking of others.	Accountable: By the end of the lesson, students should reach consensus around correct patterns in data, conclusions, and good unanswered questions.	Grading: After revisions, students should be able to provide coherent explanations that answer the Three Questions.	Grading: After revisions, students should be able to provide coherent explanations that answer the Three Questions.	Grading: Forced choice responses are automatically scored. The Grading document provides suggestions for scoring short answer responses.
Teacher and classroom community insight into …	…diversity and similarities among student ideas. T: Notice initial Learning Progression levels related ideas.	… diversity and similarities among student thinking. T: Notice initial student ideas & questions, converging on ideas and questions that move the unit forward.	…initial ability of students to connect predictions with explanations, and the Three Questions & Rules about matter & energy	… student recognition of patterns in data, ability to draw accurate conclusions, and to develop unanswered questions that cross scales	… Learning Progression levels across explanations. T: identify students who need more support in tracing matter and energy	… application of understandings to new examples and generalizing patterns across all explanations T: identify students who need more support.	… diversity and similarities among student thinking. T: Notice Learning Progression levels and areas of continued confusion.
Student self-assessment	• *What are my initial ideas?* • *How can I answer these questions based on things I've learned before?*	• *What do I think?* • *How are my ideas and questions similar to and different from other students?*	• *What do I think will happen?* • *How can I explain my predictions?* • *What information in previous units helps me make my predictions?* • *How do these compare to other students'?*	• *Am I noticing the same patterns in data as my classmates?* • *Do I understand the same conclusions?* • *What do I still need to know to figure out the phenomenon?*	• *Does my response explain the phenomenon?* • *Does my explanation answer all 4 steps on The Three Questions?* • *How can I be clearer?*	• *Can I apply my understanding of carbon-transforming processes to new examples?* • *Can I describe the general pattern in these processes?*	• *In what ways were my answers less than fully correct?* • *What do I understand?* • *What do I still not understand?*
Role in Instructional Model and Student Storyline	Preparation and planning for student resources and difficulties	Establishing the Problem *Students as questioners*	Predictions in Inquiry Cycle *Students as investigators*	Constructing evidence-based arguments; establishing problem for molecular modeling *Students as investigators*	Scaffolded explanations: modeling & coaching *Students as explainers*	Less scaffolded explanations; fading & maintenance *Students as explainers*	Summative assessment