Assessment Defined

Assessment is a tool for understanding what students are learning. Many instructors know intuitively that assessment is integral to teaching—that students learn from preparing for and taking exams. The philosophy of this chapter expands upon that knowledge. If students learn from taking exams, and we discover what they have learned by grading the exams, then why wait for the exam to test them? Both students and instructors benefit from the results of regular, ongoing assessment when it is use to “promote and diagnose” learning (Huba and Freed 2000). In short, “assessment is more than grades...it is feedback for students and instructors... and it drives student learning” (National Institute for Science Education 1999a).

Ongoing assessment increases learning gains

Assessment has the obvious purpose of monitoring learning, but the consequences are more profound from the student perspective when it is used to promote learning. In an extensive review of research about assessment in the classroom, Black and Wiliam (1998) concluded that ongoing assessment plays a key role—possibly the most important role—in shaping classroom standards and increasing learning gains. They reported that well-designed, regular assessment of students had more impact on student learning than any other educational intervention. In addition, they found that high-caliber formative assessment increased learning gains for all students, but it had the most impact for low-achieving students. According to Black and Wiliam, “formative assessment... is at the heart of effective teaching.” Thus assessment, the process of determining progress toward and achievement of goals— is an essential component of quality instruction.

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Black and Wiliam, 1998

Assessment tools that provide regular checkpoints and measures of achievement for the students determine whether they are on track and accordingly modify their approaches. Specifically, regular, ongoing assessment provides a mechanism for students to evaluate themselves and each other. As a result, learning becomes a process of reflection and analysis with specific markers of achievement, rather than simply an end point and a grade. The resulting information helps guide changes in student study and learning behavior.
Assessment provides feedback to students and instructors about learning

According to Wiggins and McTighe (1998), there are two important features in assessment: (1) what kind of performance or behavior indicates understanding, and (2) what specific criteria differentiate the different levels of understanding. In other words, assessment relates to two aspects of students performance: what students do and the caliber of their performance. The part that students do is simply the activity in which they are expected to participate. The caliber of performance deals with how well the students perform the activity. For a multiple-choice question with a single, correct answer, this is clear: A correct answer indicates excellent performance. However, more complex projects that involve writing or presentation can be trickier to evaluate. In this case, it helps to have a mechanism for defining excellence. Rubrics can be powerful tools to help students achieve excellence, and to keep instructors focused on their goals.

The primary feature of assessment is that it provides feedback to instructors and students about learning and teaching. When assessment is integrated into the learning process, students learn to differentiate between what they already know and what they need to learn, which helps focus and motivate learning. Assessment is typically categorized in two ways: formative and summative. Both formative (during the teaching event) and summative (at the end of the teaching event) assessments offer information about student learning that can shape learning behaviors and guide instructional decisions.

Feedback to students

When assessment is routinely integrated into the curriculum, it provides a mechanism to engage students and shape their learning behaviors. Metacognition is important because it is the ability to carry on an internal dialogue about what is being learned. Assessment allows students to gauge their own progress toward the learning goals and provides the feedback they need to prompt changes in their study habits. Feedback from the assessment activities, therefore, becomes an integral part of the learning process instead of just a check point at the end of a unit or semester.

Feedback to instructors

From the instructor’s perspective, assessment data should guide changes in instruction, curriculum, and teaching behaviors. Effective assessment informs instructors how students are progressing toward learning goals while the learning is occurring. The feedback from assessment guides mid-course instructional changes that can help redirect students toward the learning goals. In addition, assessment tools provide more than grades; the results can promote dialogue between students and instructors and guide changes in instructional materials and teaching. As one educator explained, “For teachers to be effective in achieving learning goals, they must engage in an ongoing process of aligning the content, themselves, and students in a specific context” (Wulff 2005). Whether it’s a prequiz about prior knowledge, a homework assignment,
a midterm exam, or an in-class activity, the time the assessment takes should be consistent with the relative importance of that knowledge or skill set as a learning goal.

Simple assessments can help guide instructional decisions. For example, a brainstorming activity can elicit students’ prior knowledge about a topic through a series of questions that students answer with an audience response system (clickers, ABCD cards, Poll Everywhere). If the results indicate that most students already know the topic, then the instructor may elect to skip the topic, probe deeper to determine how much they know, conduct a brief review, or delve into an application of that topic that requires more complex analytical skills. If the material is new to students, or they have misconceptions about it at the beginning of class, then the instructor might consider revisiting the same question(s) again at the middle or end of class to see if their understanding has improved. If understanding does not improve, the instructor should consider why and decide what teaching action to take (preferably with assistance from a colleague).

Activities can likewise provide qualitative data if students have the chance to convey what they feel is more effective, what they like/dislike, whether they feel the learning objectives are being met, if they like working in groups, whether they struggle to understand, or how the instructor might improve teaching and learning. Feedback from these types of questions can help quantify some of the more intangible aspects of teaching and serve as a mechanism to improve instruction. Moreover, students investment increases when they are given a chance to make decisions about their own learning.

Assessment and Diversity

It is important for the instructor to cultivate an environment in which all students have ample opportunity to gauge their progress toward the learning goals **during the learning process** (National Institute for Science Education 1999a). In addition to increasing learning gains, assessment can help foster inclusive classrooms. Shifting the emphasis from criticism to constructive feedback can foster open dialogue in the classroom. This creates a classroom climate that is respectful and welcoming, yet clearly focused on learning. In addition, feedback from a variety of assessment methods can help a diversity of students take responsibility for their learning in their own ways. The effect is to catapult learning beyond facts and figures and to create an inclusive classroom where students come to understand the complexities of science as well as the process of learning science.