Translation, Please!

Both educators and scientists routinely use technical jargon which causes mutual frustration and poor communication. Three often-used (and misused) education terms, constructivist, inquiry, and assessment are defined below. Hopefully, this primer will help you understand "educationese" a little better.

Definitions:

**constructivist**

"Constructivist learning...is grounded in four principles. First, learning is a process of students constructing their own meaning. Second, learning depends upon the preconceptions students bring to a subject, i.e., meaning they have already constructed at a prior time. Third, learning is dependent upon the context in which the concepts are encountered. Fourth, meaning is socially constructed; understanding develops through interaction between student and teacher and between the student and other students."

"Instruction that fosters authentic student learning can take many forms, but whatever its form it helps students (1) connect the new understanding with prior knowledge, (2) check for inconsistencies with this prior knowledge, (3) alter understandings as needed, and (4) test new understandings in yet additional contexts. It is an activity for which students must take responsibility; the teacher is there in the role of coach to help the students in this endeavor." This second definition is from Local Leadership For Science Education Reform, p. 86. See #3 below.

**inquiry-based**

"Inquiry is a set of interrelated processes by which scientists and students pose questions about the natural world and investigate phenomena; in doing so, students acquire knowledge and develop a rich understanding of concepts, principles, models, and theories. Inquiry is a critical component of a science program at all grade levels and in every domain of science, and designers of curricula and programs must be sure that the approach to content, as well as the teaching and assessment strategies, reflect the acquisition of scientific understanding through inquiry. Students then will learn science in a way that reflects how science actually works." part of Program Standard B National Science Education Standards 1996 .

See also Science As Inquiry in the National Science Education Content Standards for grades K - 4 , 5 - 8 , and 9 - 12 .

**assessment**
Simply put, assessment may be a synonym for a "test", or more generally as the process of determining what students have learned. In learning about assessment in science education you will come across many forms of assessment, so several terms are briefly defined here. Authentic assessment refers to a "test" that asks students to apply their knowledge and skills to a real (authentic) task. When such an assessment is imbedded it means that the authentic task is part of ongoing instruction. Students engaged in an imbedded assessment would appear to be doing an instructional activity, but the teacher would use the process and/or product to evaluate each student's understanding and plan further instruction.

Students are not the only targets of assessment, science programs are also assessed. In this case assessment may be synonymous with "program evaluation". Formative assessments generally refer to feedback used to improve a program in progress. Summative assessments refer to a process at a final point when results are measured against goals.

In assessing both students and programs, a "pre-assessment" is a test, interview, or set of data that measures where participants are before instruction or participation. Conversely a "post-assessment" is a congruent measurement after instruction or program participation.

Alternative assessment usually refers to methods of testing other than giving a traditional paper and pencil test. These alternatives include analysis of a portfolio of student work, design tasks or demonstrations, participation in events similar to scientific poster sessions, or oral presentations.

For more information about assessment in science education see the National Science Education Standards, Chapter 5.

**Recommended Resources:**

1. Scientists and engineers recommend this book about "student-centered" teaching and learning: In Search of Understanding: The Case for Constructivist Classrooms (Brooks & Brooks 1993), available from the Association for Supervision and Curriculum Development. From the book cover: "The activities that transpire within the classroom either help or hinder students' learning. Any meaningful discussion of educational reform, therefore, must focus explicitly and directly on the classroom and on the teaching and learning that occurs within it. This book presents a case for the development of classrooms in which students are encouraged to construct deep understandings of important concepts."

2. RISE published an issue of The Catalyst newsletter on "What Does Research Say about The Learner?" . This issue contains an excerpt on cognitive development written by Larry Lowery, a renowned speaker and writer on science learning and teaching, and professor of education at the University of California Berkeley.
3. Written for school district leaders, Local Leadership For Science Education Reform by Ronald Anderson and Harold Pratt (Kendall Hunt, 1995), can give scientists and engineers 'inside' information about the scope of responsibilities of local science supervisors. The contents include valuable strategies about developing goals for improvement, implementation and maintenance of an innovative program, developing leadership, and an illuminating section on barriers and pitfalls.

4. A Private Universe videotapes and professional development materials include a now classic example of constructivist learning. The original video in this series begins with tape of Harvard graduates--at graduation--explaining why summer weather is warmer than winter or the cause of the moon's phases. The explanations, usually erroneous, illustrate the surprisingly common fact that even though students are "taught" a concept, they didn't necessarily "learn" it.

Later, a bright young lady about 14 years old demonstrates that although she "knows" how the earth orbits the sun, her understanding is scientifically incorrect. More disconcerting, however, is how direct teaching of the scientific model results in a hybrid idea--still scientifically incorrect. It is a fascinating glimpse of conceptual development, which when applied to classroom practices reminds us not to assume that students arrive with "no" ideas about how the natural world works.

A Private Universe is often used in community presentations to illustrate the need for new methods of science teaching. These materials are available through purchase or off-the-air taping. Access the Corporation for Public Broadcasting / Annenberg Math and Science Project website for more details.

5. See "How Children Learn" (Chapter 2) in Science for All Children, published by the National Science Resources Center for a discussion focusing on elementary students. The full text of this book is available on line.

6. Scientists and engineers curious about measuring student achievement in science have found the following book helpful: "Active Assessment for Active Science raises questions about what education is all about. It does this by looking honestly and broadly at the many ways that children can let us know what they are learning. Here are children seriously engaged in trying to understand how the material world functions in all of its diversity. How can a teacher appreciate their efforts and accomplishment, in order to decide how to take their learning further?" from the foreword by Eleanor Duckworth. Information about obtaining this book by Hein and Price (1994) is available from Heinemann. Publishing.

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