Trends

Science

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Science Assessment: What Is and What Might Be

Recently Director Senta Raizen and a panel of experts at the National Center for Improving Science Education have been assembling and synthesizing current thinking and activity in elementary school science assessment with the intent of making recommendations for the future. Their work is based on the firm belief that valid assessment requires a clear definition of the goals and contents of the curriculum and should take into account what is known about how children learn science. Curriculum goals should include (1) knowing important facts and constructs of science; (2) gaining skills that characterize the doing of science (including laboratory skills, skills needed in applying science methods, and generic thinking skills); and (3) acquiring the dispositions that incline individuals to apply their knowledge and skills to new situations. A good curriculum teaches these goals through carefully selected and sequenced subject matter, with strategies that help elicit and enhance the explanations children bring to school about how the natural world works.

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If valid assessment reflects these goals and strategies, how much good assessment is occurring today in elementary classrooms? Unfortunately, not much. Science tests typically assess only factual knowledge, most often in a multiple-choice format, neglecting the skills of doing science and the dispositions to apply science knowledge. Given the constraints of most classrooms, good assessment is hard to do; but it is being done. In Great Britain, for example, current reforms encourage the use of both formal and informal means of assessing science learning: teachers' notes about their observations of students, profiles of student performance over time, structured exercises and examinations, and standardized tasks administered to students one-on-one or in small groups.

How can we recognize good assessments? First, they are often indistinguishable from instructional tasks. They match instruction, because teaching, learning, and assessment are closely interwoven, and the teacher should move comfortably from one to the other as purposes change.

Second, assessments should include hands-on performance tasks so students can demonstrate their proficiency in laboratory skills and science thinking. Such assessments emphasize the interplay between factual knowledge, understanding of scientific constructs, and practical work.

Third, good assessments probe the child's depth of understanding as well as mastery of a body of knowledge. For example, they ask students to think about a physical phenomenon and then to draw or otherwise indicate what is happening or would happen under certain conditions. These assessments are occasions for naïve or incorrect conceptions to surface, allowing the teacher to probe what students were thinking when they gave their explanations.

Finally, good assessments emphasize how an answer was obtained or an activity carried out, as well as the