A Variety of Assessment Strategies for Science Learning

Source: Insights and Outcomes: Assessments for Great Explorations in Math and Science (GEMS), Barber et. al., Lawrence Hall of Science, UC Berkeley, 1995

"Assessment is a highly charged word in educational circles… It is a complex, changing, and controversial subject that overlaps with major societal issues regarding quality of education, diversity, and equality of access, the implementation of district and state guidelines, the efforts to evolve national standards, and many other aspects of our current educational crisis. At its heart, and at its best, assessment…speaks to the continuing dedicated struggles of teachers and educators nationwide to improve instruction, to reach out to all students in effective and stimulating ways." --From the Introduction to Insights and Outcomes

Following are brief summaries of the assessment strategies explored in depth in this GEMS guide. In the book, each strategy is explored in depth with illustrated case studies. The guide also includes a teacher's journal highlighting characteristics of effective assessments for activity-based math and science, a chapter on student learning outcomes, and a bibliography of assessment resources.

ASSESSMENT STRATEGIES

Story writing – Stories help people make sense of their observations in the natural world. Telling or reading stories is an engaging way to present information; story writing is a great way to assess student knowledge.

Letter writing – Letters and persuasive writing are central to the process of science and mathematics, and to the relationship between science and society. Letter writing offers students opportunities to demonstrate their abilities to apply and communicate concepts they have learned in science units.

Advertisements – Ads marshal facts and ideas to communicate one point of view. Often statistics or experimental results are used in advertising. Because students have direct experience with media, they are often intrigued when asked to create their own "commercial" as part of a science unit.

Reflections – When teachers ask students to reflect in an open-ended way about what they know or wonder about a topic, it broadens students' view of what is important. Oral reflections take place in individual and group questioning, discussions, and student presentations. Written reflections can be recorded as journal entries, persuasive writing, articles for school publications, or reports.

Game Playing – Skills and knowledge are vividly revealed when students participate in science games. For many students, games are less intimidating and more engaging than formal tests or oral and written presentations.

Pre-Post Testing -- A student who does very well on a culminating test may have understood the concepts before the unit began; a student who performed less well may have started out with misconceptions that were substantially changed during the unit. If students are assessed in a similar manner before *and* after the unit, teachers can measure not just what students know at a fixed point in time, but what they learned.

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Model Making – Models are simplified representations of the world that enable us to think about it in new ways, make predictions, and test ideas. Model-making is a fundamental part of scientific practice and allows students to visualize the world in a deeper way than just looking at it.

Explorations – Despite its open-ended quality, exploration of new landscapes or situations is a crucial part of the discipline of science. Exploration allows teachers to observe students exercising important skills such as: using all their senses to observe, recording observations, making comparisons, formulating questions and hypotheses, and making inferences.

Experiments – When students design, conduct, and analyze experiments, teachers have opportunities to observe students: describing variables, designing comparisons and using controls, determining appropriate outcomes, critiquing an experiment, and drawing conclusions.

Investigations – Scientific investigations encompass the entire process of posing and answering questions, using a variety of tools and strategies to come to the best possible answer. Students use content and process skills to construct their own pathways, make observations, collect and analyze data, and draw conclusions.

Conventions, Conferences, and Debates – At a scientific convention, participants meet to share ideas with the larger science community. They learn about each others' research and argue, debate, and evaluate each others' work. Staging such an event allows teachers to observe students exercising their skills and knowledge.

Applications – When an activity requires application of knowledge, teachers learn whther students are able to apply concepts in new and/or real-life situations.

Teacher Observations – Teachers' open-ended observations of students' learning progress, based on specific criteria, can be an important assessment tool particularly during group or independent learning time, and can also be combined effectively with student self-evaluation.