# Alternative Assessments with Snapshots

BY CAROLYN STAUDT

Over twenty years ago an administrator walked into my physics classroom while students were working on computer simulations during class. Although the students were highly engaged, his question still resonates: "How do you know what the student is learning while using technology?"

Allowing students to use technology during class introduces a new set of challenges and demands new assessment methods. In order to analyze students' level of understanding while using models, graphs, and sensors as they investigate scientific content, the technology must have a rich set of assessment tools to track and archive student findings. Having a real-time pulse on student progress is fundamental to determining student learning and can help the teacher modify instruction. Our Snapshot tool is embedded in probe and model-based science activities to allow students to record their findings throughout an activity. This tool provides a powerful way to assess student understanding.

First developed in _Molecular Workbench_, the Snapshot tool permits students to capture their progress while manipulating a computational model of molecular phenomena (figure 1). Students can also annotate their snapshots by labeling and identifying significant features of the model (figure 2). By taking and annotating these pictures, students focus on the key features of a sequence of events, looking at cause-and-effect and effectively slowing down a simulation into discrete steps. Student snapshots are automatically added to a Snapshot Gallery, which can be uploaded and sent to the teacher (figure 3).

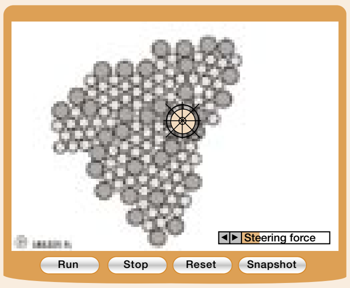


**Figure 1. A Molecular Workbench model of a molecule and a "steering" atom that will diffuse through the molecule.**

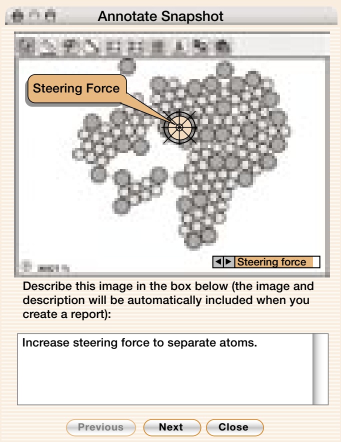


**Figure 2. A student annotates her screenshot by describing what she did or what she sees.**

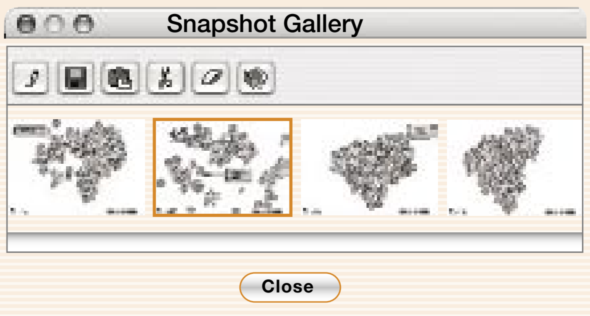


**Figure 3. Snapshot Gallery showing thumbnails of each snapshot taken by the student.**

## Taking snapshots of probe data

Snapshots are not only powerful in mapping student learning with models, but also for determining how students interpret graphs during real-time data collection. In our _Information Technology in Science Instruction_ (ITSI) activities, students use snapshots to capture their work with probeware.

Having students document their work provides a chance for students to begin the process of defending and refining their work to present to their peers and teacher. While collecting data with a probe, the student should retest and refine her experimental procedure by performing a series of collections. This continuing process of review and modification is important and minimizes the influence of individual bias by requiring that experimental results be reproducible. In other words, students do science as real scientists.

In one ITSI activity, "Heating by Hitting," students study how energy is conserved during a collision. Students embed a fast-response temperature sensor into a lump of clay and use a weight to smash into the clay (figure 4).

Theoretically, if the weight stopped moving when it hit the clay, all of the energy of the weight would end up as

**LINKS** *Alternative Assessments*

**Molecular Workbench**
*http://mw.concord.org/modeler*

**Information Technology in Science Instruction**
*http://itsi.portal.concord.org*

**UDL Science** *http://udl.concord.org*

**Physics Education Technology**
*http://phet.colorado.edu/new/index.php*

**Figure 4. In "Heating by Hitting," students measure the energy (as heat) after a weight collides with a lump of clay.**

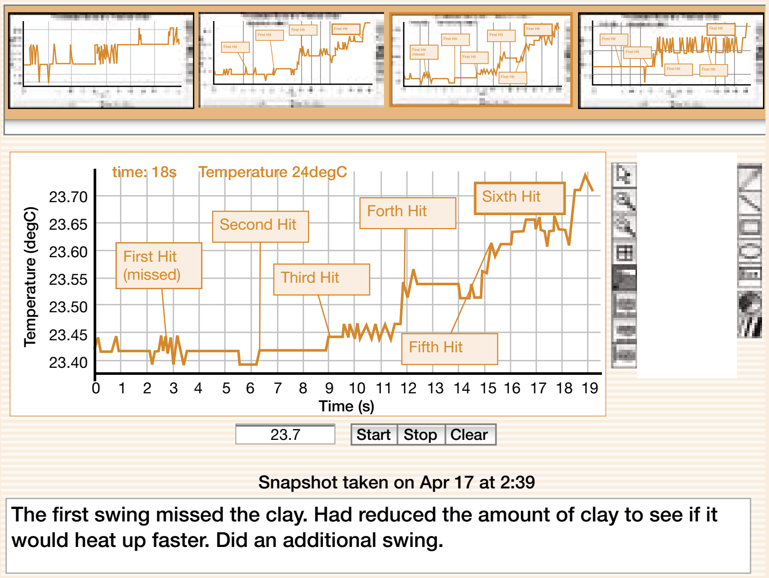


**Figure 5. Multiple graphs are saved as snapshots with individual annotations as students change conditions and run the experiment several times.**

heat in the clay. Students are asked to calculate the gravitational potential energy of the weight. After hitting the clay with the weight five times, students calculate the amount of heat energy gained by the clay per hit by using the temperature change registered on the graph. Students are asked how these two amounts of energy compare. They are encouraged to repeat their procedure and aim to have the energy transfer happen with as little energy loss as possible. Students use the Snapshot tool to document their various attempts, which might include attaching the clay to a different surface, perfecting the swing of the weight, or changing the amount of clay (figure 5).

## Drawing tool helps young students

Often, students in grades 3-6 can better describe an event by drawing than by explaining in essay responses. Providing alternative ways to communicate understanding is one of the defining features of Universal Design for Learning (UDL). (Providing multiple means of engagement and multiple means of representation are the two other defining features.) In our *UDL Science* project, Snapshot and Draw tools are both available to students.

Students are encouraged to select and label important changes that occur during a probe or model-based activity. The Snapshot tool allows students to demonstrate their knowledge in an efficient and novel method. An album of student snapshots also lets teachers have a glimpse into student understanding.

In one unit, fifth and sixth graders collect artifacts of their investigations around the question "What is electricity?" Using a Draw tool (with key elements like batteries and bulbs available as premade stamps), students predict how to light a bulb with wire and a battery. Students then try it out with an embedded *Physics Education Technology* model and take a snapshot when they successfully light a bulb. During a summative "wrap up" activity, students select specific evidence gathered in their album that helped answer the driving question (figure 6).

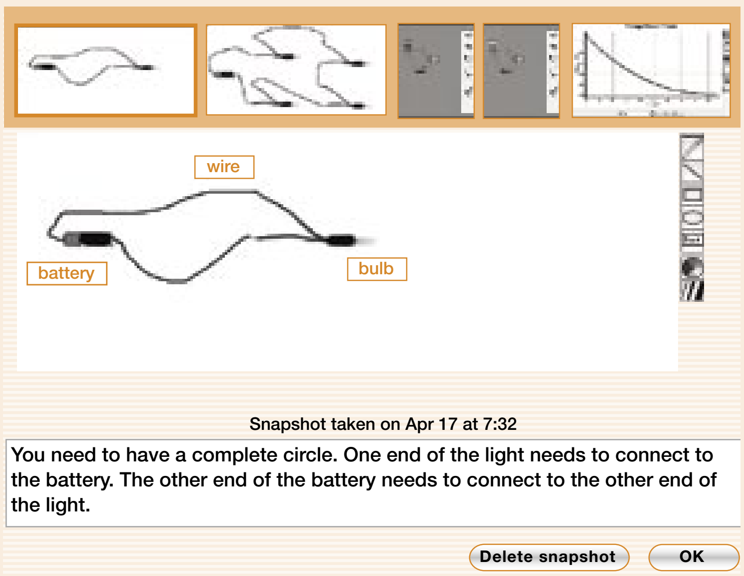


**Figure 6. Students select from an album of their saved images when they complete a summative activity used to assess their understanding.**

Technology can provide a window into student progress as well as student thinking. Our graphics tools allow students to explain their understanding of complex relationships through their choice of the graphic and the annotations that they attach. Students with weak language skills can still communicate and be assessed without worrying about grammar and spelling.

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