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Using Interactive Whiteboard to Enhance Student Learning

Several years ago I became a member of a supportive group of physics teachers trained in the use of a physics teaching pedagogy we have come to call "modeling." This approach began at Arizona State University under the direction of Dr. David Hestenes. One aspect of the program provides an active listserv for those teachers who are implementing the approach in their teaching of introductory physics. One current discussion topic deals with the use of interactive whiteboards, and I think several of the points that have been posted for discussion are important to make as you consider the use of this technology in your classroom.

An interactive whiteboard usually means a touch-sensitive board onto which an image from the computer connected to the board can be displayed. The application can be controlled by touching the board directly (just as you would control the computer with a mouse), by using special pens to draw and annotate on the screen, or using a wireless slate. Anything that can be viewed on a computer screen can be displayed on the large board and be available for the entire class to see and interact with what is being presented. Images of the annotations made during the discussion of the material can be saved and then shared via email or posting on web pages. As more of these boards are becoming available to teachers, some are questioning whether the benefits provided by these boards warrant the costs, and that question can only be answered by carefully considering what you hope to accomplish by using the board.

The modeling approach emphasizes the process by which students construct knowledge and understanding and requires students to discuss "how they know what they know." The most effective use of the interactive whiteboard is to encourage this discourse. If using the technology and designing tasks to show off that technology takes precedence over a pedagogical emphasis on enhancing student learning, then all you have is an expensive toy. If teachers learn to use the boards to engage students in questioning, predicting, analyzing, and presenting their understanding for others to examine, then the board can be a valuable tool. As we move toward incorporating Web 2.0 tools into instruction, two of the guiding axioms of EduCon 2.0 (http://educon20.wikispaces.com/) should stay paramount in our plans: technology must serve pedagogy, not the other way around; and technology must enable students to research, create, communicate, and collaborate.

Typically the first use of an interactive whiteboard by teachers will be to support their existing pedagogy as they get comfortable with technical aspects of using the features of the board. They might use it to show a PowerPoint presentation and stand at the board, lecturing and progressing through the slides by touching the board; some will even pick up the pen and add annotations to the slides for emphasis. Others might use the PowerPoint, flipchart, or notebook features to control the pace of the lecture, hurrying through the prepared slides near the end to make sure they "cover" all the points they planned for the lesson. Some will use the notebook or flipchart features and write lecture notes much as they did on a conventional blackboard.

As teachers become comfortable with how the board works, they might move to more emphasis on the physical interactivity, where they or their students go to the board or use a slate to access the board remotely and manipulate the contents. Appropriate applets may be displayed and manipulated from the board; students may collect data from these applets and then collectively or individually use that data to generate graphs. Video clips may be introduced to

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illustrate specific concepts. The size of the board is especially beneficial for whole-class lectures and demonstrations. Having the setup up for displaying visual information readily available makes it easier to present information in a novel format to capture the students' interest. However, care should be taken to set up activities that will actively engage students so that, once the novelty wears off, they don't come to view this method of instruction as just another way to "pump information into them."

The goal should be to reach the conceptual interactivity level by using this technology tool to engage students in discussions. Students should be making predictions, questioning the source of information or someone's reasoning, presenting and defending ideas to the group, interacting with simulations and interpreting the results, using graphical displays of data to support a conclusion drawn from an experiment, and viewing video or images that provide visual evidence to evaluate a prediction or illustrate a concept. Student response systems used with the board allow students to submit answers and see instantly how their ideas compare with their classmates' and can give the teacher immediate feedback on where the students are in understanding specific concepts. If a slate is available for use with the board, that slate can be passed around the class for students to display their work for group discussion.

If the board is truly used in an interactive way to engage students both by capturing their imagination and probing their understanding, the promise of using this technology to enhance student learning can and will be recognized.

Column Editor's Note: *Special thanks go to my modeling colleagues for the discussions and ideas shared on this and many other topics. The posts to the listserv continually chip away at the isolation felt by so many physics teachers. It's so helpful to be able to post a question and know that others will respond with ideas and suggestions based on experience using the same pedagogical approach. A special thanks goes to Jane Jackson at Arizona State who continues to be the catalyst for these interactions and the main cheerleader for the modeling approach (http://modeling.asu.edu/modeling-HS.html).*

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Global Warming and Melting Snow: Absorption or Scattering of Solar Radiation

In studies of the speed with which high mountain snows in the West melt to provide runoff for agricultural, municipal, recreational, and esthetic use, it was found that "stepping up air temperatures by a whopping 6°C would cause the [mountain] basin's snow to disappear five days earlier. The impacts of dust were more dramatic. 'We expected a difference of maybe five or six days between the melting of dusty and dust-free snow, says hydrologist Andrew Barrett with the National Snow and Ice Data Center. Instead they found that a single dust event could cause snow to melt away 18 days earlier than it would if there were no dust at all."[1] The dust comes from many sources including desert lands and lands that have been overgrazed.

1. Michelle Nijhuis, "Dust and snow: High in the snowy San Juan mountains, tiny particles have big implications," *High Country News,* pp. 4-–5, May 29, 2006.