

WHITEBOARDING: a learning process

by Don Yost, Modeling Workshop leader

DoYost@aol.com

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On casual observation, whiteboarding may seem to be little more than a student giving a report from an erasable hand-held whiteboard, punctuated occasionally by teacher or peer interruptions to question. Whiteboarding and reporting actually have different purposes. The report is a presentation intended to demonstrate competence and is usually graded. Whiteboarding, on the other hand, is an active learning process in which evaluation is ongoing and serves to guide the learning process. Whiteboarding is a teacher directed process designed to probe a student's prior understanding, and to construct strategies to bring the student to a more complete comprehension. Students can and are encouraged to participate in the discussions, but it is still teacher directed. That direction may be so subtle as to be invisible, but it is, nevertheless, a key ingredient in the process.

The whiteboard should contain just enough information to demonstrate understanding. Typically, in a kinematics lab, the whiteboard would include a motion map, a sketch of the graph shape with labels, and the mathematical model along with a conclusion. Notice that data tables, axis numbers, and calculations are not included, as they add no information on concept attainment. Students show the class their whiteboards as they explain their lab results or problem solution. The teacher may occasionally interrupt the student to ask questions, probing the student's understanding and directing the student's learning process. Often a teacher will ask for clarification or expansion of a correct answer, realizing that while the answer may be right, the reason may be in error, or simply wishing to emphasize a particular point. Some common questions might be "how do you know?", "did you mean ...?", "how does your result compare to the first group?", and "Why did you answer that way?" This aspect of whiteboarding distinguishes it from a report. A report is given uninterrupted, and then critiqued by the audience. Whiteboarding is an active process in which the teacher guides the student toward understanding during the student's explanation.

In addition to the benefits of guiding the learning process as it takes place, the whiteboard allows students to clarify and define their understanding through verbalization. Putting concepts into words is a powerful means of checking true understanding, as students often do not even realize they do not understand something until they try to explain it.

When done correctly, whiteboarding is often an exhausting process for the teacher, leaving no time for evaluating "art work". You must listen to what the student says, interpret what he actually means, anticipate common misconceptions, design a learning strategy, and construct a series of questions to achieve that learning goal. The process of listening, interpreting, and constructing a strategy all at the same time is a highly demanding skill for a teacher.

The question of grading whiteboards often comes up. Whiteboarding is much like any process of learning a skill. If you are teaching a child to ride a bike, you know that they are going to have difficulty with balance. You design a strategy that probably involves walking along, and when they start to fall, offer suggestions or guide them toward skill mastery. It would make little sense to grade them on how well they are learning, since error is a natural part of the learning process and is expected. Your goal is not how well they accomplish the learning process, but first, that they try, and finally, that they succeed. If you test, you evaluate how well they ride the bike after the instruction process. Whiteboarding is much the same. You may grade participation or final understanding, but not the process of learning.

There has been some misunderstanding in the role of the teacher in whiteboarding. If students are whiteboarding a pendulum lab, there is little need for teacher directed inquiry. Student directed questions are appropriate since the only surprise is the independence of mass on period, and that is easily observed. At this stage, we are not explaining it, just observing. On the other hand, when we are whiteboarding Newton's first or third law or the idea that an object can push back, the teacher's role is critical in organizing the dialogue in a way to provide the necessary bridges for the student. I, as an experienced teacher, already know that most students will not understand these concepts. They will give the correct answer, easily accepted by their peers, so that it will require careful inquiry by the teacher to actually probe their alternate conceptions. This will not occur with only peers asking questions because they share the same alternate conceptions.

Whiteboarding may be done in front of the class, but presenting in a round table format where all students can see all other whiteboards has proven less stressful for most students. In this "circle whiteboarding" format, the teacher often circulates behind the students and provides suggestions to individual groups.

WHITEBOARDING DO's AND DON'Ts:

Do:

- ask for clarification.
- draw simple diagrams..
- draw simple graph shapes.
- include multiple representations.
- be involved
- consider whiteboarding as a learning process.

Don't:

- grade the learning process.
- badger the student.
- include raw data or intricate graphs
- criticize answers.
- expect students to provide all questioning.
- consider whiteboarding as a presentation or report.

For more information on whiteboarding, visit <<http://modeling.asu.edu/listserv.html>>