

why I use interactive

WHITEBOARDS

In its January 27, 2010, online issue, *Teacher* magazine published “Why I Hate Interactive Whiteboards,” a passionate article by Bill Ferriter. Hatred seems like a strong reaction to an inanimate object, but here it is tied to frustration about budgetary priorities, the lack of evaluation of the effectiveness of interactive whiteboards (IWBs), and the lack of accompanying training. If that were as far as Ferriter took his objections, I might agree, but the heart of his argument is as follows:

... interactive whiteboards are an under-informed and irresponsible purchase. They do little more than reinforce a teacher-centric model of learning. Heck, even whiteboard companies market them as a bridging technology, designed to replicate traditional instructional practices (make presentations, give notes, deliver lectures) in an attempt to move digital

teacher-dinosaurs into the light. I ask you: Do we really want to spend thousands of dollars on a tool that makes stand-and-deliver instruction easier?” (Ferriter 2010)

Whether IWBs are a defensible purchase depends on many factors, but to condemn them because they can be misused is unreasonable. Any tool can be misused. That is not the fault of the tool.

In his article, Ferriter seems to think that teachers should never “stand and deliver.” I don’t agree. In my view, we should be the guide on the side, sometimes, and the sage on the stage, sometimes. Student exploration can lay the foundation for powerful teacher exposition; teacher explanation can be the necessary trigger for a rich student-centered activity. The blanket rejection of either side of this coin is self-defeating. Skillful teaching is largely about navigating back and forth between those classroom modes.

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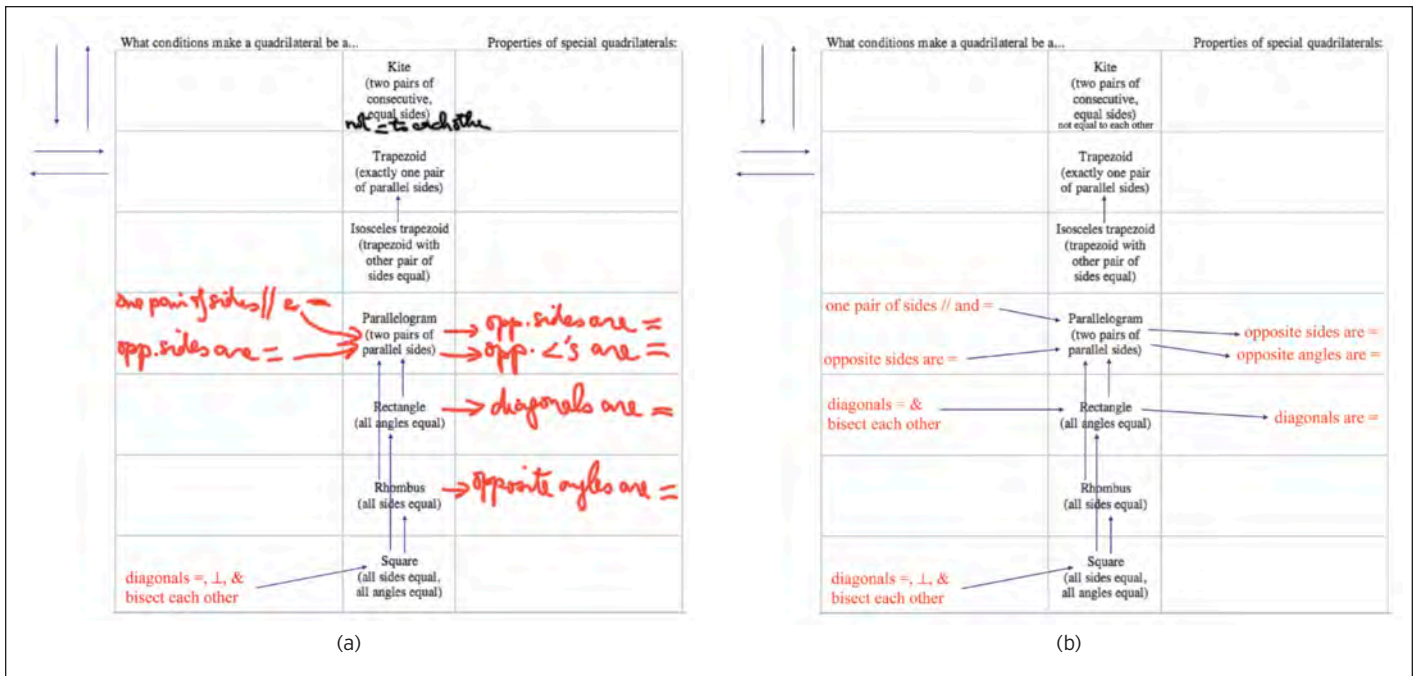


Fig. 1 Over a period of a few weeks, students make conjectures about quadrilaterals and then prove or disprove them. When a theorem is proved, I add it to the interactive whiteboard, which serves as our collective memory (a). Students also keep track of the theorems to figure out what they would like to prove next. To keep our work legible and organized, periodically I type up what was previously handwritten on the board (b).

Ferriter’s one-sidedness is captured in this statement: “If we could turn control of learning over to students, we’d probably see motivation and academic growth levels rise all at once” (Ferriter 2010). Frankly, I have yet to see a successful classroom where control of learning has been turned over to students. The opposite is more likely: The most productive student engagement and the best learning happen in classes where savvy teachers orchestrate a complex mix of instructional strategies, not in classes where the teachers have abdicated their responsibility to lead.

In any case, back to interactive whiteboards. I concede that there is much frustration when the technology fails. IWB malfunction has forced me to reboot my laptop many more times than I care to remember. This is a waste of precious class time. Another concern is that, unlike other documents in my computer, IWB files are not searchable. They become vastly more useful if one has a “table of contents” in a word processor or other searchable software. The weekly assignment sheet I give my students serves this role for me.

On balance, however, I have no doubt that the IWB has made me a more effective teacher. Here are some of the ways I use it.

ARCHIVING

A key feature of the IWB is that everything written on the board can be saved on my laptop. As a result, I can look at last year’s lesson and be reminded of how it actually played out, thereby reducing the risk of repeating the same mistake or forgetting a particularly interesting segment. A recent example: While reviewing an old board on quadratic functions, I was reminded of a wonderful unplanned digression about what happens to the parabola when the parameter b is varied in $y = ax^2 + bx + c$. This digression led me to ponder whether this investigation should be incorporated as a standard part of our algebra 2 or precalculus course.

Within a lesson, I can back up to an earlier board or a previous day’s board to discuss a mistake I might have made, to have a deeper discussion, or as a prompt for a writing assignment. I can also copy and paste items from one board to another, a significant time-saver for me and a help in seeing continuity and flow for the student. In fact, information on a single board can be updated day after day (see **fig. 1**).

Moreover, students have access to what was on the board on any given day, a particularly useful feature for

those who have trouble taking notes. Note taking is a recurrent theme in student course evaluations:

- “Writing down class notes on the smartboard really helped me learn. It allowed me to stay focused and refer back to previous lessons if I needed refreshment.”
- “The smartboard notes helped a bit before tests. I utilized them on the first two tests.”
- “I think that revision on the smartboard was a great tool, since it allowed me to learn again what we did in class.”
- “Putting the boards on the course conference was really helpful for studying for tests and quizzes. All of the drawings were really helpful.”

In an extreme application of this capability, toward the end of a BC Calculus class, I once created a single gigantic file that combined crucial boards from the whole course. Students enjoyed flying through so many key ideas and techniques in a single time-traveling period.

Of course, one should not expect the IWB to incorporate the level of detail that would be available in a textbook—

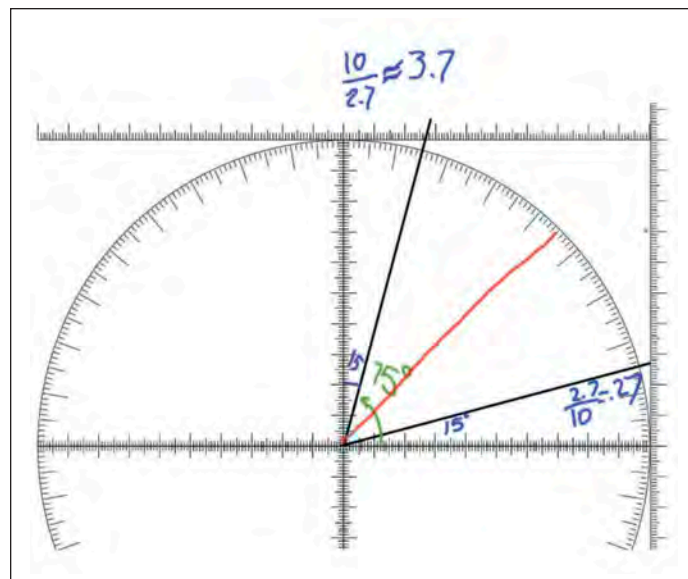
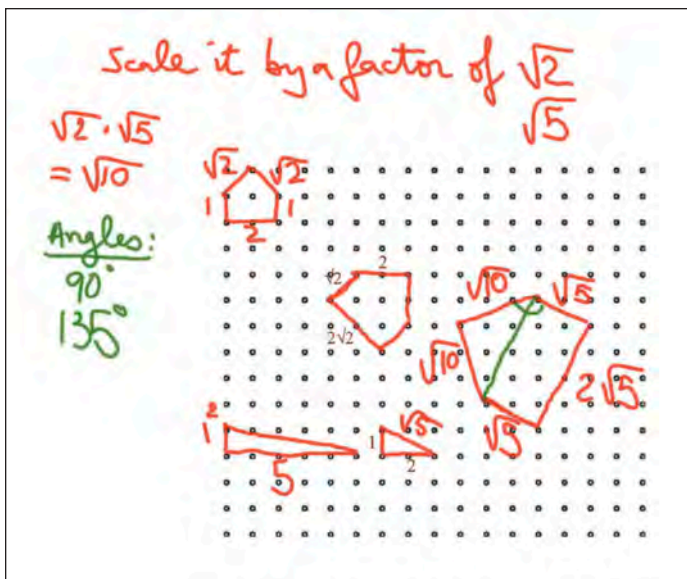


Fig. 2 After students have struggled with this exercise involving similar figures and the Pythagorean theorem, it is convenient to display the dot paper on the board to facilitate a whole-class discussion of the underlying ideas.

Fig. 3 Students use a “protractor” to find the slope that corresponds to 15°. Note that a calculator gives the tangent of 15° as 0.267949192, so direct measurement on the IWB is reasonably accurate. Students do this work on paper; the IWB allows the teacher to demonstrate the technique accurately and discuss a follow-up question, such as the slope that corresponds to 75°.

it is, after all, just a very incomplete record of what happened in class that day. However, if students were absent, the boards provide a good springboard for a conversation with the teacher or a classmate about what they missed.

A VISUAL AID

Another key use of the IWB is as support for visual representations. I always have access to “graph paper” of all types—with axes, without axes, polar, logarithmic, isometric, and so on. I likewise have access to dot paper, geoboard paper, whatever activity sheet my students are working on, any figure or text from any book, and so on. For many students, such aids are much easier to decipher than verbal references to the figure or the text or to freehand drawings without the benefit of a lattice or grid in the background (see **fig. 2**).

A related benefit is that one can use extremely accurate figures on the board, which is very helpful to students who are not as adept at interpreting my approximate sketches. Such accuracy is important in almost any part of mathematics: graphs in algebra, any sort of figure in geometry, the ten-centimeter circle in trigonometry, and so on. Yes, it would be nice if all students had a strong-enough understanding so as

not to need accurate figures to support that understanding, but that’s not the reality of the classroom (see **fig. 3**).

The IWB also has dynamic capabilities: It allows one easily to demonstrate geometric transformations such as translation, rotation, reflection, and scaling by actually performing them right on the board. This is, of course, useful in many parts of mathematics. In a pedagogically wonderful move, a colleague used that capability of the IWB to graph an even function by hand. After sketching the graph in quadrants I and IV, she simply duplicated and flipped the resulting figure to get quadrants II and III. This maneuver is worth a thousand words about symmetry.

I can use manipulatives on the IWB with unbelievable ease (as compared with needing special overhead projector versions of the manipulatives). I can demonstrate an activity, and students can share their discoveries, whether using Algebra Lab Gear®, geometric puzzles, or pattern blocks. Each of these uses of manipulatives is an example of whole-class discussion laying the groundwork for student collaborative discovery at their tables—or whole-class discussion offering a way to wrap up such discovery (see **fig. 4**).

IMPACT ON STUDENTS AND TEACHERS

Over time, the IWB affects students and teachers in many ways, some of them subtle. Students love going to the IWB to present a proof or a solution, although it takes a while to get used to the technology. They also love to give me advice on how to manage my own interaction with the IWB software. (Many of them have developed quite an expertise by watching many teachers work with it.) It also allows them to use the IWB software on their own laptops quickly to create and annotate figures that involve manipulatives. These figures can then be copied into a word processing document as part of a report.

Because I know that I’ll be saving the boards, my handwriting and board organization have greatly improved. Having the option to “turn the page” (or extend it) means that I no longer try to cram a ton of information into increasingly small spaces. Alas, I still find it difficult to keep my writing horizontal!

I can annotate the IWB after the fact. When I have time after class, I go through the day’s boards and type in clarifying comments, highlight important words, remove confusing items, and reorganize so that the boards are easier to decipher. Sometimes a student

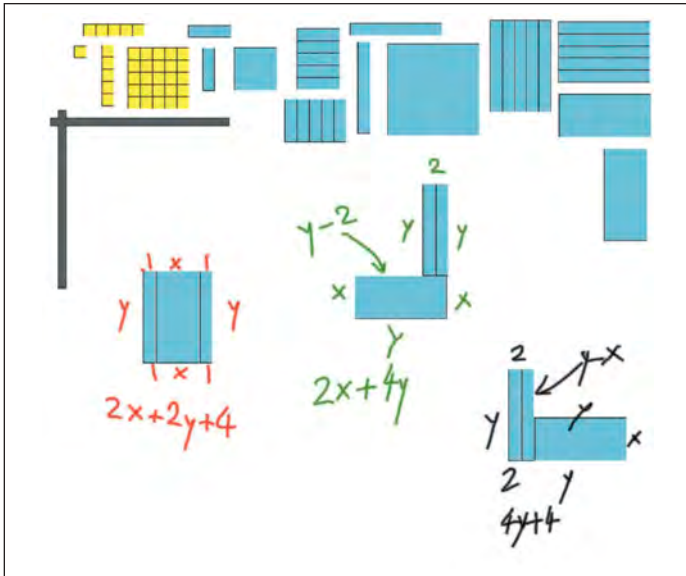


Fig. 4 The blocks at the top of the board can be infinitely cloned to form figures below. Here, the challenge was to find the perimeter of the given figures (the expression below each figure is the perimeter of that figure). The IWB facilitates this discussion by making it possible to reproduce exactly the blocks or tiles that the students are using at their tables.

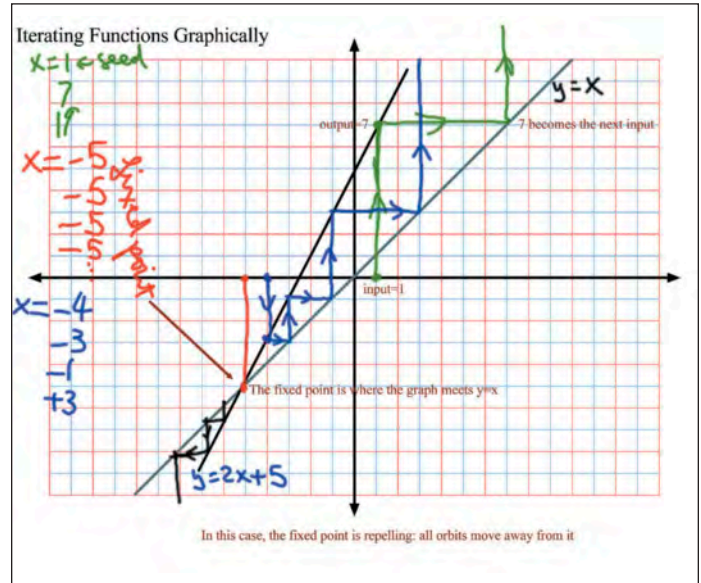


Fig. 5 This is a graphical illustration of iterating the function $y = 2x + 5$ using three different seeds. The typed commentary, which was added after class, makes the saved board more useful to absent students.

said something of crucial importance that didn't get written on the board; I can add it at this point. Finally, I post the annotated file where students have access to it (see **fig. 5**).

IWB software makes it easier to share lesson plans with fellow teachers. The sequence of prepared boards is itself a plan for the lesson, but the ability to include images, tables, and graphs of all sorts helps flesh out the outline. The added visuals are particularly useful in collaboration with a less experienced colleague.

Finally, I've seen other teachers find excellent uses for the IWBs, some of which I haven't yet fully explored myself. One colleague clarifies algebraic manipulations by using multiple colors as she writes and then clones parts of an expression to use in an equivalent expression on the next line. Another has devised games and activities in which the students directly interact with the board in a language class (I'll have to develop similar ideas for mathematics).

STUDENT-CENTERED LEARNING

In the end, no matter what the technology, it remains true that *students* have to do the learning. All the theorems in **figure 1** were conjectured and proven by students. Students did the exercise in

figure 2 on dot paper before it was discussed at the board. The activity launched in **figure 3** is an introduction to the concept of tangent, in which students find the slope corresponding to many angles on paper by measurement and calculation. The perimeter problems in **figure 4** are introduced and debriefed at the board, but by far the bulk of the lesson takes place at the students' tables in cooperative learning groups. The illustration in **figure 5** follows student experimentation in iterating linear functions on the calculator and precedes further experimentation with nonlinear functions on the laptops.

In short, IWBs can be helpful in a student-centered, teacher-led classroom. As I have tried to show, they offer many possibilities that were not previously available as well as combine in a single interface what I used to do with a combination of traditional whiteboards, butcher paper, PowerPoint™-style slides, and overhead projectors. The IWB is primarily a tool for the teacher, and this is why I focused this article on the teacher's role. But, I should make clear, most of the time my students work in cooperative groups, with the help of calculators, manipulatives, and laptops. This fact, of course, has not changed as a result of adopting IWBs.

REFERENCE

Ferriter, Bill. "Why I Hate Interactive Whiteboards." *Teacher* magazine. January 27, 2010. http://www.edweek.org/tm/articles/2010/01/27/tln_ferriter_whiteboards.html&levelId=1000.



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