

The Benefits of Doing It Wrong

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In the early 1970s, Rosalind Driver, then a graduate student in education at the University of Illinois, had a peculiar notion. To understand how children learn important scientific concepts, she argued, we first need to grasp how they see the world before they start school. Children do not come into their first science classrooms as blank slates, with no sense of the natural world or of the way objects move in space. Talking with children, Driver showed, often revealed that they had quite fully developed (if incorrect) ideas about scientific phenomena.

Her crucial — and radical — insight was that learning is dependent on preconceptions. We learn by revising our understanding of things.

Reading about her work recently got me thinking about how to make use of the misconceptions that students bring with them to the college classroom. Too often, students are taught to hide their mistakes, to keep quiet if they're unsure of the answer, to feel ashamed for getting it wrong. But just as Driver's work showed how important it is to elicit student misconceptions, we should be looking for ways to highlight students' mistakes so that we — and, more important, they — can learn from them.

By patiently interviewing students about the way they saw the world, Driver provided the first detailed information not just about where students tended to go "wrong" but how. She established a new area of research in science education, laying the groundwork for a great many studies of how students understand important concepts. Reflecting in 1989 on the progress of such studies, Driver, who died in 1997, noted that they illuminated "problems of communication and understanding that exist at the heart of the job of teaching."

Kimberly Tanner — whose 2005 co-written article on misconceptions in biology education called my attention to Driver's work — notes that instructors in college science courses don't invest much time "finding out in depth what students already know and, more specifically, what they do not know, what they are confused about, and how their preconceptions about the world do or do not fit with new information they are attempting to learn."

Given that students learn by discovering that their preconceptions are wrong and need to be revised, we may be severely limiting their opportunities for learning if we have no sense of what they know coming into our classroom. Tanner writes that "explicitly uncovering and

addressing students' prior and alternative conceptions in biology is essential if students are to integrate new ideas into existing conceptual frameworks about how the natural world works as a result of instruction."

Those "prior and alternative conceptions" become a road map for faculty members — a guide to which concepts an instructor needs to spend more time on to help students understand.

Likewise, for those of us whose classrooms focus on skills (what philosophers call "knowledge how") more than concepts ("knowledge that"), students' mistakes offer a similar map. Pay attention to where and when students make mistakes in writing or other skills, and you'll have a better idea of how to teach them.

The same logic works from a student's point of view: Making mistakes, even intentionally, can help guide students toward doing something correctly.

I also thought about Rosalind Driver, and her attention to student misconceptions, when I came across a 1987 article, "The 'Do it Wrong' Approach to Teaching Writing," by Gerald Grow, a professor of journalism at Florida A&M University. His first sentence lays out his argument vividly: "Deliberately writing badly can be an effective way to learn to write better, because knowing when it's bad is an essential element in knowing when it's good."

Grow's essay detailed his approach to teaching writing: At various points in the semester, he asked his students to "do it wrong" — to deliberately break writing rules and make mistakes. One assignment asked students to write a page of prose with as many grammatical errors as possible. He also assigned students to write terrible opening paragraphs for a series of article ideas. At another point, he gave his students a list of criteria for good journalistic writing (focus, use of factual detail, paragraph development, etc.), and then asked them to "write a short article that is spectacularly bad in every category."

What's the point of all of that deliberate blundering?

Well for one thing, Grow argues, such exercises are fun for students and help to alleviate their fear of failure. The professor is asking them to make mistakes — suddenly it seems OK that they don't always know the right way to do things.

The do-it-wrong strategy seems to work particularly well with students who resist being taught. "This approach," Grow wrote, "seems to activate some capricious side of the self and gives it a job and a voice: producing negative examples for the class to enjoy and learn from." That last bit — that the students share and learn from one another's deliberate mistakes — is crucial. Each of Grow's assignments has some collaborative element to it: Students trade papers, try to fix their classmates' errors, discuss the rules that were broken, and, eventually, try to write the correct way.

Teaching students to "do it wrong" could work in almost any college classroom. Philosophy students can try to create arguments with as many logical fallacies as possible. Mathematics students can construct a solution with a deliberate error and then see if their classmates can spot it. Engineering students can design a bridge that won't hold more than two people at a

time. Each of those exercises could be designed to help students see what the "rules" are, and why they are important.

The goal is to hold students' mistakes up to the light. Especially if led by an instructor who has a good handle on common mistakes, these exercises can focus students' attention on how such mistakes happen, why they are a problem, and how to prevent them.

Doing it wrong helps to teach skills for the same reason that eliciting misconceptions helps to teach content knowledge. By inviting students to write badly, or perform an experiment incorrectly, or botch an equation's solution, and then having them share their mistakes, we can get students to think about the process of writing, or performing experiments, or solving equations.

We all know we're supposed to learn from our mistakes. Why not turn that into a teaching tool?

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