

# Diagnostics and remediation: 2 dirty words we need to start using in discussing math



Here are two dirty little secrets about most American schools:

- few have a program for remediating students who are several grade levels behind in math
- almost none of them have or use any kind of diagnostic program that can tell them where their students are in math.

If that's shocking to you, it should be.

Math skills of American students are execrable. That's strong language, but it's true. It's true whether the student is the poorest of the poor, or the richest of the rich, and includes everyone in between. The best I've ever seen over an entire population of a school is about 60% of students at grade level. I'm no longer surprised when I find that less than 10% of any given class is at grade

level. This is simply the reality on the ground.

Why do we allow this to happen? I'm not sure. If you were at a party and said that you couldn't read, people would be horrified. Nobody's horrified if you say you can't add a couple of simple numbers together. Rather, you'll have much sympathetic giggling in support of your innumeracy.

I'm not optimistic about the willingness of America to tackle this problem. I just don't see the movers and shakers caring enough about it to fix it, and I see little pressure from the voting populace to make the kind of cultural change that happened after Sputnik, where math and science expertise among students became questions of national security.

If we suddenly *were* to become serious about fixing the math problem, there are two things we have to do. Most educators consider these suggestions to be anathema. Notwithstanding that, they are in my view the only way to fix the problem.

First, we must know where the problems are. One of the biggest surprises I had when I started teaching math in 2007 is that no school had a diagnostic math test for their students. If you had a student who appeared to be behind, your guess was as good as anybody else's about ailed that student. There was no hard data at all. I was particularly surprised when I joined LAUSD (Los Angeles Unified School District) and found that the district had no diagnostics whatsoever available to math teachers.

The typical response you get is "well, we evaluate the student on the basis of their CST (California's year-end test) scores." That's nice, but in fact evades the question. The CSTs are, at best, an indicator of how well a student does in a particular subject. It gives you no guidance whatsoever about whether the

student is one grade or five grades below grade level, or where their gaps are, or what it is that the student doesn't understand. The CSTs are a very blunt tool and won't give you what you need to be helpful to student, which is knowing what skills the student lacks.

Diagnostic tests seem to be low on the food chain of educational research. I have a decent library of books about designing tests, and practically none of them have anything about diagnostics. Richard Linn and Norman Gronlund, two of the gurus of testing, offer the following observation about diagnostic tests:

*Persistent learning difficulties may require the use of diagnostic tests. For this type of testing, a number of test items are needed in each specific area, with some slight variation from item to item. In diagnosing students' difficulties in adding whole numbers, for example, it would be necessary to including additional problems containing various number combinations, some requiring carrying and some not, to pinpoint the specific types of errors being made. Diagnostic testing is a highly specialized area that has been somewhat neglected in educational measurement. There are some published diagnostics test but these are primarily in the basic skills area. In other areas, teachers have to depend more heavily on the diagnostic features of formative tests or prepare their own diagnostic tests and assessments.*

Linn and Gronlund, *Measurement and Assessment in Teaching* (8<sup>th</sup> ed. 2000), p. 141.

One problem with using diagnostics is political. If you know where students have gaps, you become obligated to fill them. Easier just not to know, so you

can throw up your hands in despair. You don't often get people admitting to such moral bankruptcy, but you get something very close to it when you raise sharp questions about how skilled the students really are. My first two years of teaching were extraordinarily difficult because most of my administrators excoriated me for identifying gaps and not being "positive about your students' strengths." Now, I'm among the first to recognize my students strengths, particularly urban students who are growing up in an environment that would crush most middle-class suburban students or their parents. That, however, does not mean that I'm going to ignore their problems in math. I need to find them and fix them, not cover them up because it's unpleasant to look at. It shouldn't surprise you to learn that I've had very little resistance from students, once they realized that they *could* learn math.

By the way, there are diagnostics available. Like Linn and Gronland suggested, I've developed a number of my own that are highly targeted at basic skills. I also am a big fan of the [Mathematics Diagnostic Testing Project](#), a long-standing venture between the University of California and the California State Universities that have extremely useful readiness tests with excellent feedback for courses beginning at the pre-algebra level and running through calculus. Doubtless there are other diagnostics out there. My point is simply that I've never had an administrator direct me to one, which is itself telling.

So here's the first dirty little secret: most schools don't use diagnostics. We need to be upfront about this and insist upon their use so that we can know exactly where the students are in their math skills. Anything less is a complete betrayal of our moral obligations to our students and their families.

Suppose we start using proper diagnostics and get a real baseline of where our students are. What then?

What's then is the second dirty little secret: remediation. It's a dirty word in educational circles today, for reasons I don't entirely understand. I haven't been able to find anybody who can explain why it's anathema to talk about fixing a problem. I suspect that it comes from the days when we tracked students and shoved students of color into classes like "basic math" or "shop math" or "math for homemakers" which were meager offerings that did nothing to teach what the students needed. I agree with Robert Moses that every student should have the civil right to take and succeed at algebra. But unlike many, I take that argument seriously, and recognize that simply mandating a result doesn't accomplish it.

Here's an example, taken from the annals of LAUSD, though it could be taken from almost anywhere. No high school in LAUSD can offer a course lower than algebra 1. Period. No exceptions. The goal was positive: let's get out of the business of shunting failing students (who coincidentally happened to be students of color) into meaningless math classes. The result, however, has been disastrous, and is a complete betrayal of the promise of algebra for all. The district will insist that everyone take algebra 1, but will offer no assistance or support to the student that's seriously below grade level. I guess it's "pull yourself up by your own bootstraps," a technique that I've never seen work with remediation.

There it is again, that nasty word: remediation. I don't care if you call it something else (I've often suggested calling a remedial math class something that sounds sophisticated, like "Numerical Analysis"). But let's not avoid the hard decision: many kids are multiple grades below grade level, and they need serious and immediate help. Throwing them into an algebra 1 class will not teach them anything because they don't have the building blocks to master algebra, which is at its core an abstract form of basic arithmetic. If a student

doesn't understand arithmetic, algebra makes no sense whatsoever. Putting such a student in algebra condemns them to guaranteed failure from the start. Given the other pressures and stresses on these students, who have a long history of being beaten up by their failure in mastering mathematics, this is pure cruelty, even if the intentions are good.

Whether the policymakers like it or not, the only solution is to acknowledge the problem and devise an appropriate sequence of remediation. I've taught a lot of what would have been called remedial math back in the day, and I have almost always been successful at getting students to algebra readiness by the end of a year with them. However, it simply can't be done *and* teach them the rudiments of algebra 1. Pre-algebra, yes, but even that only barely. Still, it's doable with the right teacher and the right course in a single academic year.

This means a major rethink by policymakers, whether at the district or school level. If a student is seriously behind, algebra 1 is a guaranteed failure. The students who can't hack it in algebra 1 need to be identified and supported by being placed in a class that will get them caught up by the end of the year. In high school, that means algebra 1 will first be taken during a student's sophomore year, and geometry (assuming the typical sequence of algebra 1/geometry/algebra 2) in the junior year. If the students are a year or two behind their peers in math, that still a lot better than condemning them to 4 years of failure.

My suggested program differs from the old days in that I reject shoving low-performing students into dead-end math classes where they learn nothing. If anything, they need to be placed in classes with the best teachers and an interesting curriculum, of which practically none exists today. This program also flies against the orthodoxy in most math departments, which has the best

teachers teaching AP (Advanced Placement) courses where the students, if they test well on the AP exams in May, get college credit. The AP students, however, can pretty much look after themselves, whereas the struggling students will drown without the best support available.

One thing that does *not* work is double-booking of math classes. Many charter schools in Los Angeles recognize that their students are behind in math, and double the number of math classes for each student, one being the regular class and another being the remedial, “drill” session. These drill sessions are ghastly: worksheet after worksheet of repetitive, dull problems with no relief in sight. The students are disruptive because they’re either bored or out of their depth, or both. Every time I’ve seen one of these classes, I think of the old joke that “the flogging will continue until morale improves.” Except it’s no joke if you’re a student stuck in that situation.

What does a successful remediation (yes, *remediation*) program look like? It knows where the students are and honors that. It starts them where they can succeed and builds on success. If the student needs to learn subtraction or multiplication, then that’s where you start, and work up the hierarchy: multiplication, division fractions, negative numbers, decimals, percentages, ratios, and graphical representations. You need to send students out onto the campus to measure everything they can and do meaningful computations with the figures they bring back. You have to teach money skills, making change, figuring how much a car will cost you at a given interest rate. After years of abstract calculations, you have to make it *real*. It’s a hard program to develop and to teach, but it *is* successful.

If you build this, they *will* come, and they will succeed. I’ve seen students go from disruptive behavior problems to real mathematicians once they

understood the mathematical logic of what they were doing and started at a level where they could be successful. One of my most cherished moments as a teacher was when a 10<sup>th</sup> grade boy, who had repeatedly failed algebra 1 and was disqualified from playing football, realized that he had passed me class, and more importantly, learned something. With tears in his eyes, he told me “I never thought I’d understand division...and now I do!” That’s what we need—and what we should demand—for all our students. But let’s not kid ourselves that we can solve this problem without knowing where they are and holding both them and ourselves responsible for fixing what ails them. Diagnostics and remediation are necessary words that need to make their way back into our vocabulary.