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Stratifying Math Students

Why ability grouping is essential in secondary mathematics

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A Hard Look at 8th-Grade Algebra

In 1999, I began teaching at a school in Austin, Texas. In this school at the time, every 8th grader in the school took Algebra, followed by Geometry in 9th grade, and so on. I call this a one-size-fits-all math program. Such a program is virtually unavoidable when new schools start out, for the simple reason that schools are always under tight budget constraints and with a small student body it is hard to justify the economics of staffing multiple math sections for each grade. Every small school I have encountered has followed this same model.

However, there is a problem here. If you look at mathematical placements among students nationwide, it is immediately apparent that only a relatively small proportion of students take algebra in 8th grade. The norm is for students to complete their pre-algebra studies in 8th grade and take algebra as freshmen in high school. Since this is the norm, I call this the “grade-level” course. Students placed in 8th-grade algebra are therefore in an accelerated placement, compared to what is typical nationally.

So how is it that schools, in which at least half the students possess average ability, can place every

8th grader in algebra and get most of them to pass? Do they have some secret for math education that the rest of the country does not have?

Of course not. The reason schools can get away with placing every student in 8th-grade algebra is that they do not require students to *master* what they are taught.

Defining Mastery

An important aside: I use the term *mastery* to denote real learning characterized by demonstrable proficiency at the skills being taught and long-term retention of these skills. In other words, instruction, practice, and assessment are all geared to produce students who are proficient—they can solve representative problems at any time with a high level of accuracy—and who retain this proficiency for months or years after the chapter assessment.

Passing without Learning

Let’s return now to the question of why all the 8th graders might be passing algebra. In fact, students have access to many ways to earn credit toward the grade in a math class. Homework usually counts for around 30% of the grade. There may also

be points for projects or class participation. Especially pernicious is the widespread practice of teachers giving points to students for correcting errors they make on quizzes or tests.

The net effect of these scoring rubrics is that students are allowed to put together points that amount to a passing grade without having actually learned the math. There are many ways to get a homework assignment done, and many of them don't require any math comprehension at all. Students can copy someone else's work, get help from friends or parents, reverse engineer the answers in the back of the book, and so on. Because of this, homework papers are not a legitimate indicator of whether the student has learned anything. Homework assignments are a necessary activity, of course, but they are not valid assessments of whether students have learned. But in math courses in schools across the country, homework assignments serve as a vehicle for students to obtain passing credit even while obtaining failing scores on tests.

Any school that wants to improve math performance by leading students toward genuine proficiency and long-term retention must cease giving students credit for homework, class participation, test corrections, and the like. In math, the only way to demonstrate proficiency in a mathematical concept is by solving problems on tests. Thus, the best way to assess and assign grades is to base the grade almost solely on exam and quiz scores.

This brings us to the issue in the title of this article. You will almost certainly have a train wreck in your school if every student takes algebra in 8th grade and their course grades are based solely on exam scores. The fact is that not everyone can master algebra in 8th grade. Average kids are not developmentally ready for it until 9th grade. In fact, my own experience in over 20 years of teaching is that on average about half of our students in private schools are ready for algebra in 8th grade and about half are ready for it in 9th grade. In public schools, these percentages may be a bit different, depending on the schools demographics, but even in

areas where students are receiving the best possible preparation, the statistics of human cognitive development limits the percentage of students ready for algebra in 8th grade to about 50%. Since this is the case, the implementation of a mastery-based math program depends on proper student placement. And this means stratifying students into at least two different ability groups.

Is Tracking Bad?

In public schools, such ability grouping is usually called tracking. Tracking has been so poorly managed over recent decades that many educators now believe it to be a bad idea, arguing instead that students of all abilities should be grouped together. The idea is that a heterogeneous learning environment is good for everyone. In my view, this may be the case in history and literature classes, but it does not work in math. In a literature class, any student possessing at least average ability can follow along and participate in a class discussion. A student may be a poor writer and may thus earn a C in the class, but the students' abilities do not prevent them from understanding what is going on in class.

But in a math class awarding grades based on mastery, which I strongly advocate, mixed ability grouping results in some students mastering the material readily and being ready for new topics while other students can barely keep up, if they can keep up at all. Any teacher who has tried to teach in such a one-room schoolhouse environment knows that it is virtually impossible. The brightest students are bored and need more to do, while the modestly gifted students are lost and in need of slower pacing and more extensive practice.

The obvious solution to this dilemma is to stratify the math placements so that each student is placed in a class suited to his or her ability. For a student body made up of people with at least average ability, the placement needs of 95% of students can be met by having two placement options, one entailing algebra in 9th grade for students of average ability, and one entailing algebra in 8th grade

for students with exceptional ability. Occasionally, highly talented students come along who are genuinely capable of mastering algebra in 7th grade. If the school has a large enough student body to staff three separate math sections for three separate ability groups, then this is the optimal arrangement. However, many smaller schools do not have the student numbers to offer a dedicated math section for the small number of students who begin algebra in 7th grade. Instead, the usual practice is to place the 7th-grade algebra students in sections with the 8th-grade algebra students.

Ability distinctions in math start becoming quite noticeable by 6th grade. However, the usual elementary school format allows students to remain together in their classrooms for math. But upon entering 7th grade, where teachers are dedicated to specific subjects, stratification by ability in math becomes essential. It is advisable during 7th and 8th grade to keep placements provisional, and to provide for movement between strata for students who bloom late and can move up, or for students who find they are not cut out for accelerated placement after all.

The Art of the Placement Process

Schools including both elementary- and middle-school grades must have a placement process for 7th-grade math that is both robust and sensitive. Both educators and parents must be made aware that placement is a process that continues for a year or more, and that decisions are not considered final until the end of 7th grade. I have found the process described below to be very effective.

The placement process begins early in the spring during 6th grade. At this time, 6th-grade teachers compile a spreadsheet with their recommendations for math placement in 7th grade. The teachers take into account the students' maturity, work ethic, and grades in math, as well as any other factors the teacher knows about from working closely with the students. Each student should be identified as ready for grade-level placement, ready for advanced

placement, or borderline between the two.

After the initial placement recommendations have been compiled, middle-school administrators communicate these recommendations to the students' parents, designating them as *preliminary* placement recommendations. These letters are sent to parents at the end of the 6th-grade year. This allows the summer for parents to respond if they need more information or wish to discuss alternatives.

During the fall term of 7th grade, students are divided into grade-level and advanced placement groups, with the two groups studying essentially the same pre-algebra content. Teachers monitor student performance closely. If any student in the advanced-placement group does not maintain performance consistently above an average of 83, the teacher begins a dialog with school counselors and the students' parents about potentially moving the student to the grade-level group. Likewise, students in the grade-level group who consistently score above 97 or 98 are considered for re-placement in the advanced group. Re-placements are effected during the semester break (or sooner if circumstances warrant). During the spring term, the two groups become increasingly distinct: grade-level students continue practicing pre-algebra basics, while accelerated students move toward algebra readiness.

At the end of 7th grade, all advanced-placement students, along with any grade-level students who are interested, take an algebra-readiness test. (This exam can serve as the final exam for advanced-placement students.) Students who score 83 or higher on the algebra readiness exam are deemed ready to move into Algebra in 8th grade. All other students continue in Pre-algebra or Introductory Algebra until 9th grade.

Even after students enter their 8th-grade classes, schools should be prepared to accommodate students who blossom later and are interested in the challenge of moving into the advanced-placement group. One way to do this is to allow students to acquire credit for Geometry by exam after 9th grade. Students fulfilling this requirement may then move



into Algebra 2 for their sophomore year.

When the school manages the placement process well, parents and students know that the school is providing ample opportunity for all students to be

properly placed throughout the placement process.

This openness protects the school community from the perception that students are being trapped or tracked without opportunity to change.

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