Math on the Fast Track

by Quincy Howe

One of teaching's great pleasures is to watch one's students perform at the peak of their powers. When I began teaching more than forty years ago as a professor of Latin, those peaks occurred when my students, in perfect metrical cadence, would read aloud the passage they were about to translate. Now I am a computer teacher in an inner-city Catholic elementary school, where I teach the best and brightest how to do math a year above their present grade levels. I get the same rush of delight when a student grasps a new procedure with transparent ease.

During my years as a teacher, the world of learning has been transformed by computers, by standardized testing, and by rigorously calculated distribution curves. Those trends need not, however, dehumanize instruction, nor need they leach the joy from a teacher's life. As soon as I started teaching fast-track math classes in the computer lab five years ago, it became clear that my students were enthralled by the sense of empowerment provided by using the computer. At the same time, it was becoming obvious that schoolwide scores on standardized testing—in this case the ITBS, which all grades take during the month of March—were the best way to track their progress.

As an experiment we purchased math-assessment software. It ran only on an individual work station, so we had to evaluate students one at a time. The new program seemed to motivate students with its numeric closure and the sense of competition it provided them, both with their own recent scores and with the scores of their peers. We decided to purchase a network software package that ran to all thirty-five stations in the computer lab. The first year we deployed the software, the schoolwide average in terms of national standing on the math ITBS rose from the 42nd to the 59th percentile. The following year it went up to the 64th percentile, where it continues to hover. Although we are the poorest school in the poorest district in the Archdiocese of New York, we are

running about ten percentile points above the citywide performance of Catholic elementary schools.

Once we had established steady schoolwide exposure to math assessment two or three times a week, it became evident that some students would be able to pass the assessment tests at their present grade levels well before the end of the school year. In fact, the more spectacular achievers were surpassing their current grade levels by Christmas break. Honorifically titled "grade jumpers," they were assigned work at the next grade levels. Those who had become grade jumpers before January would, in some instances, become "double grade jumpers" by passing the assessment test for the year above their present grades. Thus, a student in the fourth grade who passes his own grade in December would begin work on fifth-grade math in January. By April, the same student could pass the fifth-grade test and begin work on the sixth-grade test with eight weeks still left in the school year.

By the end of June 2005 there were twenty-six grade jumpers and nine double grade jumpers in our school of 300 students. In a distribution curve, those students would represent the top 10 percent of the student body and could be expected to have IQs above 120. Gender distribution among the grade jumpers has proved to be exactly equal—thirteen boys and thirteen girls at the end of 2005.

Not only is that a significant sample for a student body of 300 students, but for a school consisting of Puerto Ricans, Dominicans, Africans, Caribbean Islanders, and African Americans it represents something of a Rousseauian *retour à la nature,* not yet contaminated by stereotypical thinking about gender roles in the sciences. What's more, as math performance drifts above the 90th national percentile, the language performance of many students from bilingual homes usually enters a similar range.

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One of the traditional strengths of parochial schools—particularly true in the inner city—is their ability to draw their students into tight ranks that advance across the field of learning like the Greek phalanx. As students of ancient warfare will recall, the soldiers in a phalanx march shoulder to shoulder with spears extended and shields held upright. The strength of the strong and the weakness of the weak merge into one irresistible force.

Suppose, however, that among your spear bearers are Ajax and Achilles, along with the inevitable Pentisilea. In fact, following parochial school tradition, I had retained my grade jumpers with their age group in the first year of the software-based math program. Over time, however, the rush of energy associated with the original grade jumping began to fade. I suspected that students were not retaining the knowledge they had initially demonstrated; some of the previous year's success had been the result of recognizing mistakes the second or third time through the assessment test.

Other factors compounded the problem. For one, the grade jumpers' neighborhood provides little kudos for high achievement in math. Occasionally, in fact, I have watched former grade jumpers purposely slip back into a less-stellar range of performance. And, as those who have taught math standing before a class of seventh- or eighth-graders will have noticed, another obstacle is the greater level of abstraction inherent in algebraic and geometric concepts. A student at ease with standard modes of computation is now asked to multiply complex equations, such as $(x + 5)(2y - 3)$. A typical brainteaser for the emerging adolescent is to determine the area of a label on a tin can when the radius and the height are known. The journey from the radius of the can to the length of the label takes place in the initial thickets of formal operations. At any given moment perhaps a third of the class can follow a presentation of such compound complexity, while the remainder is adrift in a sea of simulated comprehension.

In addition, the eighth-grade year can serve as the launching pad for a catastrophic excursion into early teen chaos. There is no older cohort to restrain the obstreperous ways of eighth-graders, and the urgency of favorable placement into a good high school does not compete with the sense of a lifelong verdict that surrounds college entrance. In my first five years at St. Pius, only two students passed the eighth-grade test.

The opportunity to sequester advanced grade jumpers from such environments did not present itself until last year. With the help of a modest grant, we set up an advanced computer lab with twelve work stations. This year, nineteen grade jumpers from grades one through seven come to the lab in clusters of twelve three times a week; they are all working on math one year ahead of their present grade levels. Securely

corralled with their high-performing peers, they effectively have been deprived of the chance to backslide.

Time spent with this group is unlike any teaching I have done previously. When a student who has already been identified as gifted sits face to face with a math problem that clearly matches the next step in her math competence, there is no intrusion of wandering attention, debilitating diffidence, or languorous aversion to the task at hand. When students have to compute a novel and pesky problem—say, the area of a piece of paper to wrap a package—I have their undivided attention. They can move adroitly from front to back, top to bottom, side to side, and then assemble the diverse pieces into an appropriate answer. The work of the teacher consists both of answering questions and of provoking the students to ask questions. Reluctance to engage with the teacher and unwillingness to appear ignorant in the company of peers no longer hinder learning.

This is the most direct and immediate teaching I have ever experienced. The software ensures that the problem at hand represents the next logical step on the learning curve. Success with previous problems and my expectations of quick mastery are powerful motivators. And, unlike the typical classroom setting where one presents new information irrespective of manifest interest, this format allows me to respond to the immediate and precisely focused interest of the student. Comprehension and the rate of progress are swift. Within three months, meeting three times a week, these students will complete forty chapters of an instructional program that presents the full year of math above their present grade levels. Upon completion, students will take the exit exam, and in many instances, they will pass on the first attempt.

This year, five members of this year's seventh grade have locked horns with eighth-grade math and taken a standardized written test in eighth-grade math from a different publisher. Three of them scored 85, 90, and 95 percent on the assessment. If all five eventually pass the exam, as we expect, they will be able to spend eighth grade working on algebra, beginning geometry, and bits and pieces of trigonometry. Then, in high school, they can anticipate a close encounter with calculus, and a concomitant improvement in college prospects.

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To take the discussion full circle back to my early experiences as a Latin professor, I can say that the computer, the massive accumulation of performance data, and the descriptive power of standardized testing have all become powerful allies in my life as a teacher. The computer itself imparts a continuity that counters any sense of arbitrary or haphazard progress. The software is designed by professional educators who are fully cognizant of state and national curriculum standards. To work on a

computer that corrects problems instantly imparts a sense of closure that the classroom setting generally fails to achieve. In most schools, the reason "no student is left behind" is because the train fails to leave the station. When working on a computer, students get an immediate evaluation of how they have done and, if necessary, they can repeat the procedure until it becomes second nature. The immediate task before the teacher is to nurture a sense of unerring competence. When that ripens to full maturity, then nothing can compare with the moment when a student, faced with a new procedure, grasps the solution with effortless ease.

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