Algebra II + all high schoolers = overkill

By Joseph G. Rosenstein

The Star Ledger, April 29, 2008

The recommendation of the New Jersey High School Redesign Committee that all students take Algebra II in order to graduate from high school is based on two false claims that have been promulgated by Achieve, Inc., a national organization whose perspective and conclusions the Redesign Committee accepted unquestioningly.

One false claim is that learning Algebra II improves your chance for success in college. It is true that those who complete Algebra II do better in college than those who don't, but there is no research that shows that they do better **because** they have taken Algebra II. We want high school students to recognize the difference between correlation and causation, but this is hard to do when policy leaders repeatedly blur the distinction.

A second false claim is that all students need to take Algebra II because this course is needed for success in business and industry. In fact, when asked about the skills that their employees need to have, what employers name are all Algebra I skills. It is hard to make the case that topics like complex numbers, rational exponents, systems of linear inequalities, and inverse functions – all topics in Achieve's Algebra II course – are needed by all students. When was the last time you needed to factor trinomials?

Both of these claims, and their implication that all students should take Algebra II, are rejected by essentially all New Jersey mathematics educators who have been actively involved in efforts to improve mathematics education in the state. Thus for example the 2005 report of the New Jersey Math Task Force impaneled by Acting Governor Richard Codey and Commissioner William Librera (which was never released), made over 30 recommendations, but did *not* recommend Algebra II for all students. Yet the High School Redesign Commission made no effort to seek the input of these professionals, and made recommendations about mathematics education without involving those in New Jersey who have expertise in the area.

What all students need to take and master is Algebra I. That means that the New Jersey Department of Education should progressively strengthen its assessment of high school students and progressively raise the passing score so that all students are indeed expected to learn and apply the topics in Algebra I. All students who have difficulty with Algebra I should be provided with suitable opportunities to strengthen their understandings and skills in algebra, and all teachers should be provided with the assistance that they need to help their students achieve success in mathematics.

Am I against Algebra II? Not at all. It's great stuff. It's essential for anyone who is going to college and wants to keep options open, because many college majors require calculus. However, Algebra II is not essential for *all* high school students.

This is an odd position for me to take. I have consistently advocated that we have high expectations for all students and that we adopt high achievable standards. As a Rutgers professor of mathematics and as Director of the New Jersey Mathematics Coalition (now transformed into a math and science coalition), I played a key role in developing New Jersey's math standards in 1996 and 2001, and was editor and co-author of the New Jersey Mathematics Framework.

Why do I take this position? Much of the impulse for improving education comes from the very welcome participation of the business community. Their concern comes from two circumstances – the lack of math skills of the regular workforce and the shortage of people for the technological workforce. Both of these are real problems, for business and for our nation. But Algebra II is not the solution to either of them.

For the regular workforce, what is needed is not more algebra, but better algebra – not Algebra II, but a thorough understanding of Algebra I – and a better grasp of the utility of mathematics. Four years of high school math would be great, but instead of Algebra II it should include more probability and statistics, since we all need to make sense of data, in both our personal and civic lives; more emphasis on applications of math in today's world, from bar codes to networks to animation to internet security; and more problems that develop students' skills in reasoning and problem solving. This kind of mathematics, which would be both appropriate and valuable for all students, is quite different, in both content and flavor, from the very traditional mathematics that the Redesign Commission recommends as the "core section" of Algebra II on which all students would be tested.

For the technological workforce, what is needed are ways of attracting more college-bound students who *have* acquired the mathematical background into scientific careers. That doesn't mean focusing on getting more students into Algebra II, but rather finding ways of making math and science more interesting and appealing for the large number of students already taking Algebra II.

Should we have high expectations for our students? Absolutely. Should we raise expectations for all of our students? Absolutely. Should we encourage more students, particularly those from economically distressed backgrounds, to succeed in mathematics? Absolutely. Enabling students from all backgrounds to achieve high standards, enabling all students to understand and use mathematics, enabling all students to see the value of mathematics in today's world, should be our goal.

That won't be achieved by requiring all students to take Algebra II.

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