

President's Message

Pushing Algebra Down

Cathy L. Seeley



We expect more mathematics of our students in today's rapidly changing world than in years past. One result of higher expectations seems to be that an increasing number of schools are choosing to offer, or require, a course in algebra for students in grade eight. In some schools, the move is to push Algebra I down to earlier grades. The motivation for this is admirable and appropriate—all students need to learn challenging high school mathematics that prepares them for postsecondary programs. But this particular solution may not be in the best interests of our students.

In contrast to the traditional United States secondary mathematics program, the curriculum that our colleagues in Canada teach does not define Algebra I as a separate course, but rather integrates mathematics content from algebra, geometry, and statistics into a continuous pre-K–12 program. In the United States, we have struggled to bridge the gap between computational procedures at the elementary level and a secondary program anchored by a course called Algebra I. We have often used middle school to review and remediate students who have not mastered the arithmetic taught in elementary grades. Rather than bore the students who have mastered these skills, we have frequently followed the practice of accelerating some students into Algebra I prior to grade nine. Thus we often created a cycle of inequity and untapped potential. Parents of students chosen for acceleration were proud, while we lowered our expectations for the rest of our students.

Today, we recognize that this cycle of low expectations and missed opportunities for some students has resulted in a large number of students leaving high school ill-equipped for future options. One solution embraced by parents and policymakers has been to offer or require Algebra I sooner and for more students. Expecting all students to complete four years of high school mathematics that begins with this gatekeeper course is not only a good idea, but is also our moral and ethical responsibility. But moving from a system that limited many students to no high-school-level math courses to a system that suddenly requires students to begin their study of high school math in grade seven or eight may not be an appropriate or a desirable solution.

One argument in favor of early algebra says that early algebra classes make it possible for more students to take five years of high school mathematics through precalculus or even AP Calculus or AP Statistics. However, many communities are finding that students who start algebra early do not necessarily end up studying more mathematics. In fact, some students complete their mathematics requirement prior to grade 12 and choose not to enroll in any mathematics course for the year or more before they go on to postsecondary study or work. This can have disastrous results.

Any system offering or requiring Algebra I at grade eight or earlier should seriously consider two important points. First, how can the system ensure that students develop the skills and think-

ing that comprise a rich middle school program? And second, what lies ahead for students at the other end of their high school mathematics sequence?

To address the first point, many middle schools have all students explore a rich array of mathematical topics anchored in proportional reasoning that extends well beyond the unit I used to teach on ratio, proportion, and percent. Students with a deep understanding of what it means for two quantities to be proportionally related have a tremendous likelihood of success at Algebra I or the first year of an integrated high school program. Ideally, middle school mathematics should continue to develop algebraic thinking from the elementary curriculum and should connect to important ideas in algebra and geometry, also allowing students to deal with data and elementary statistics. If your middle school program does not offer this kind of powerful mathematics focused on proportionality and algebraic thinking, consider changing the program, rather than accelerating students out of it.

The second point is equally important. There is little or no reason to accelerate a student into Algebra I unless the student intends to continue mathematics study through the equivalent of geometry, Algebra II, precalculus (including trigonometry), and a fifth year of secondary study in an academically appropriate course such as calculus or statistics. If your school does not offer such courses or encourage students to continue through the full sequence, there is little benefit to accelerating a student into secondary mathematics.

Whether students are in a good traditional program or a good integrated program, they should take algebra early only if they are highly motivated to do so, only if they intend to study mathematics through the calculus or statistics level, only if the system is structured to accommodate this advanced study, and only if the student also studies proportionality and the most important components of a good middle school program. Far more important than *when* students study algebra is *what* they study and *whether* they are taught in a way that helps them learn it and use it for the long term.

We must expect all of our students to learn mathematics well beyond what we previously expected. We need all students to be more proficient than in the past, and we need many more students to pursue careers based on mathematics and science. So let's address several questions together: How do we make the development of algebra a continuous part of the pre-K–12 curriculum? How do we teach algebra at the secondary level in a manner that engages, challenges, and prepares all students for the mathematics they need for their future? How do we give more to students without necessarily starting them earlier?

Join me in a President's Chat, 5:00 p.m. ET on Wednesday, March 16, when we will discuss these important questions and other related issues.

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