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What Kind of Math Matters?

Some experts say the push for higher-level coursework isn't a good fit with the skills used in the workplace.

By [Sean Cavanagh](#)

Few education issues elicit as much resolute support from political and business leaders as the call for higher standards in mathematics. The idea of requiring students to complete more years of math—and more demanding math—while in high school continues to gain traction, driven largely by the belief that students will need stronger skills to compete in tomorrow's economy.

But what if tomorrow's economy requires something less?

As states increase academic requirements, some researchers and labor experts say the push for more rigorous math study actually doesn't fit with the skills that employers, even those in many high-paying fields, demand.

In many well-paid, in-demand jobs that require some math, the level needed rarely rises above 9th grade or 10th grade content, some observers contend. Fluency in advanced math topics is less crucial than skill in problem-solving and in applying math to different tasks, they say.

There are clear benefits to taking advanced courses such as Algebra 2, labor experts and education researchers agree. Studies show that students who take advanced math in high school are more likely to succeed in college and secure better-paying jobs.

But if a central goal of high school is to prepare students for the workforce, the push for tougher curricular requirements and coursework needs to be rethought, some suggest. They also say creating courses that place a greater emphasis on real-world or "applied" math, as opposed to simply increasing academic requirements, could not only improve students' workforce skills, but also their enthusiasm for that subject.

Wrong Mind-Set?

"We have gotten into a college-for-all mind-set," says [James E. Rosenbaum, a professor of sociology, education, and social policy at Northwestern University](#) in Evanston, Ill., who has studied the connection between school and work. When people suggest that schools place a greater emphasis on math than on "applied math," he says, "it sounds like we're denying an opportunity."

"The world has changed. Employers need more skill," Rosenbaum says. "Educators assume those skills mean 'college.' What I think [future workers] need are good, solid 10th grade skills."

In the mid-1990s, Rosenbaum surveyed employers who hired workers in a wide range of office and manufacturing professions on the skills they considered most important. He focused on entry-level jobs that had the opportunity for advancement but did not require a college degree.



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[Table of Contents](#)

Of the 51 employers interviewed, 35 said they required workers to know relatively basic math, such as how to do simple arithmetic and to add fractions, although some jobs required algebra and trigonometry. Some managers, however, said they had difficulty finding workers with even basic math skills.

The need for relatively basic math was also evident in research conducted by **Michael J. Handel, a professor of sociology at Northeastern University** in Boston, as part of a report he is completing. Last year, Handel surveyed 2,300 employees from a broad range of job backgrounds. They included “upper-white-collar” workers, such as managers and technicians; “lower-white-collar” employees, such as salespeople; and a range of blue-collar and service employees, such as factory and food-service workers.

[Handel] questions the assumption put forward by many policymakers that taking more advanced math will make students more appealing.

As part of a special analysis conducted for *Education Week*, Handel found that while 94 percent of workers across those occupations reported using some kind of math on the job, just 22 percent said they used any math more advanced than adding, subtracting, multiplying or dividing. Only 19 percent said they used math reaching the level of Algebra 1, and 9 percent used Algebra 2.

Strong majorities of workers, by contrast, said they used more basic math, such as fractions, multiplication, and division.

Even among upper-white-collar employees, such as managers, only 30 percent said they used Algebra 1 on the job, and only 14 percent said they used Algebra 2. Many of those white-collar jobs, Handel notes, are likely to be among the fastest-growing occupations in the country between now and 2014, according to federal labor projections.

Handel emphasizes that he is not arguing that students should “take less math,” or that they should not seek to take advanced courses in the subject. But he questions the assumption put forward by many policymakers that taking more advanced math will make students more appealing, or more useful, to employers in the future job market.

“These results should temper some of the more exaggerated and perhaps more emotional claims about the purported mismatch between school and work,” Handel says. He says he hopes his research will help “inject a note of realism” into debates about the math skills required on the job.

High-Wage Earners

At the same time, Handel and others agree that completing advanced math courses such as Algebra 2 has clear benefits in helping students succeed in college and get good jobs.

Roughly 84 percent of young workers in the top-paying 25 percent of jobs have finished at least one yearlong course in Algebra 2 or a higher-level math class, according to **study released in 2003** by Anthony P. Carnevale and Donna M. Desrochers for the **Education Testing Service**, the nonprofit, Princeton, N.J.-based testing giant .

“[T]hose who get the best jobs have taken the most mathematics,” the authors wrote, adding: “Clearly, Algebra 2 is the threshold mathematics course taken by people who eventually get good jobs in the top half of the earnings distribution.”

Research shows that only a small proportion of workers—less than 5 percent—make extensive use of Algebra 2, trigonometry, calculus, or even geometry on the job, Carnevale and Desrochers found. That fact doesn’t necessarily mean, though, that schools would be better off scaling back requirements in advanced math. Those classes also help students cultivate superior math-reasoning skills, the authors say.

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you need later,” says James Rubillo, the executive director of the **National Council of Teachers of Mathematics**, a 100,000-member professional association in Reston, Va. “You have comfort and confidence when you’re faced with complex computation.”

That opinion was shared by Kurt W. Berglund, who took a job as a software-design engineer with the Microsoft Corp. last year. His work often requires skipping between the math he took early in high school and more advanced principles, he says.

Berglund, 25, says he often relies on linear algebra in designing 3-D software. He has to be familiar with multivariable problems and calculus in reading design research. And he uses a process similar to “proofs” from geometry in trying to write better software codes.

“You’re looking at your code and wondering, will this work all the time?” Berglund says. “You’re kind of reasoning in your head.”

Occasionally, he says, he consults his college mathematics textbooks when he needs to brush up on a concept. “I actually wish my math was stronger,” he says. “You’re definitely using the whole palette.”

John D. Kraman, a senior policy analyst at **Achieve**, a Washington-based nonprofit organization that advocates high academic standards, says schools can demand strong math curricula that are still flexible. Achieve, which was formed by governors and business leaders, supports having all students take a core of high school math classes that will present them with material equivalent to Algebra 2—even if they don’t take a course with that exact title, Kraman says.

Schools should not simply allow students to opt out of more challenging math courses, given the educational and professional benefits of taking those classes, he added.

“You end up with a horribly inequitable system,” he says, which risks “kids in poor schools getting poor math.”

State graduation requirements in math have steadily increased over the past decade. Twenty-four states now require students to complete three years of math before graduating from high school, according to the **Education Commission of the States**. Only two states—Alabama and South Carolina—require four years of math, though 10 other states and the District of Columbia are phasing in that requirement, according to the Denver-based ECS.

Seeking Work-Related Math

While most states have avoided prescribing a specific math curriculum in high school, more detailed mandates are increasing. Just three years ago, three states—Arkansas, Indiana, and Texas—were phasing in requirements for students to complete Algebra 2 before graduating from high school, unless students sought special permission not to do so. Today, seven states are moving toward implementing an Algebra 2 requirement, the ECS says.

As those graduation requirements increase, policymakers should make greater efforts, some observers say, to supplement traditional advanced courses with other math options for students, such as classes that emphasize applied and workplace skills.

Such courses could be just as challenging academically, but could also present math less abstractly—an approach that, in turn, would keep students more interested in math, and in school overall, Carnevale and Desrochers say.

Rubillo, of the math teachers’ organization, believes students would benefit from more “alternative” fourth-year math courses as high school seniors—classes that integrate math with lessons on business, personal finance, computers, and other subjects. Taking a fourth year of math in high school is crucial because students who lose touch with the subject are more likely to require remedial work when they enter a two- or four-year college, says Rubillo, a former community

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college math teacher.

Creating such course options poses obvious challenges to schools, however. School districts already struggle to find enough educators qualified to teach math, particularly advanced courses. Finding teachers with the training necessary to combine math with business and other specialized areas would be especially difficult, Rubillo says. And schools also lack textbooks and other resources to help guide teachers through those lessons, he says.

Many employers in technical fields are “extremely frustrated” that high schools do not incorporate applied math and problem-solving into math classes, says Marc McCulloch, a consultant for **Siemens Building Technology**, a division of the worldwide engineering and electronics company based in Switzerland.

Taking classes such as Algebra 2 is crucial for students considering careers in engineering-related fields, says McCulloch, a former high school principal who is also the president of All Students Can Learn, an education services company in Dyer, Ind., that promotes workforce skills.

But to keep students enthusiastic about math and math-related careers, it is equally vital to show them what makes the subject relevant in various professional fields, he says. The emphasis on real-world applications is strong in elementary school, when many students study lessons such as math and money, but it gradually fades from middle to high school, McCulloch contends.

“When it comes to high school, math teachers go solely theoretical,” he says. “When a student asks, ‘Where can I see that applied, where would I use a polynomial?’ teachers look at them like, ‘You’ve got to learn it. It’s a good foundation thing.’ They can’t tell you, it’s for reaction rates in chemistry, or you’ll see this when you’re combining chemicals.”

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