If American children went to school most anywhere else, their algebra experience would be vastly different.

Here, many students never study it. Among those who do, most wait until their freshman year in high school or later. By then, it is an abrupt shift into the world of abstraction.

Not so in Germany, Japan, Argentina, Korea, France and other developed countries. In those nations, all students are expected to conquer beginning algebra. They start early -- routinely in the sixth or seventh grade -- and study it thoroughly until they reach high school.

"In the United States, only about 25 percent of students in the middle grades get algebra. Everywhere else, basically 100 percent get it at that point," said William Schmidt, national coordinator of research for the Third International Mathematics and Science Study. Widely known as TIMSS, the study draws regular headlines because it usually shows American children behind other children in the world.

That embarrassment has helped prompt a revolution of sorts in math education, especially when it comes to beginning algebra. Although few U.S. schools are going as far as those in Europe, Japan and other places, the shift has been unmistakable.

In California, the algebra overhaul is hitting two levels -- middle school and high school. The state's academic standards now say that algebra should be taught beginning in the eighth grade, a new and somewhat controversial ideal. And state law now requires that all high school students, starting with this year's freshmen, master Algebra 1 to graduate.

It is a tall, tall order, and one that is rocking schools throughout Sacramento and the state.
The eighth-grade algebra goal has left middle schools grappling with how to teach a tough subject that historically has not been their province. Responses have run the gamut. Some schools have cautiously studied the options, while others have jumped in and placed all students into algebra.

Teachers and principals have expressed private doubts, saying middle school is too early for many to learn algebra. Even at the high school level, some teachers believe that not all students can or should be required to complete the subject.

To the naysayers, the algebra allies point across the sea.

"I don't believe it for a second. I see too much evidence in other countries, where algebra is just the norm for everyone," said Sue Stickel, an assistant superintendent for the Elk Grove Unified School District.

Elk Grove has been on the algebra bandwagon for years. It has required Algebra 1 as a condition of graduation since 1989, and it recently added geometry to its list of graduation requirements.

When it comes to the eighth-grade front, however, Elk Grove looks like most other districts -- about a third of its top students complete Algebra 1, while the majority enter high school without it.

Middle school algebra has long been a hot topic for families in the area. Those eighth-graders who have taken it often had savvy and aggressive parents who pushed for it.

Take Spring View Middle School in Rocklin. At one time, the campus offered no algebra. But about five years ago, a small group of parents began insisting on it for their high-achieving youngsters.

The mothers and fathers wanted their kids to be challenged in math. And they were aware of something else: Those who don't get beginning algebra out of the way before high school may not get all the way to calculus by the time they are seniors.

It's a basic math problem: There are four years of high school, but five years of math courses in a typical precollege lineup -- Algebra 1, Geometry, Algebra 2, some form of Trigonometry or Math Analysis, and Calculus.
Algebra proved popular at Spring View. By last year, the school was putting about 30 percent of its top students through the course.

But reaching all eighth-graders, as the standards now recommend, will not be easy, even there.

"It's going to be a real stretch," said Spring View Principal Marjorie Crawford. "The majority of our kids are not ready for Algebra 1 at the eighth grade."

The same is true in districts across the Sacramento region. The San Juan Unified School District, long considered a premier system for its historically strong test scores, had 16 percent of its eighth-graders mastering Algebra 1 during the 1998-1999 school year.

It's a common problem in the United States, according to Schmidt, the TIMSS expert.

To understand why it happens, and also why it need not, look at how math is taught elsewhere in the world, he said.

In the United States, students have tended to study basic arithmetic from kindergarten through eighth grade. Seventh and eighth grade are notorious for being wastelands of arithmetic -- fractions, decimals, multiplication, division -- that students have seen before.

Then boom, in ninth grade, students hit algebra -- a mathematics course that is tough and abstract. They are expected to learn it in a single year.

By the standards of other nations, Schmidt said, that is cruel and unusual punishment.

Most developed nations teach arithmetic through grade five or six. Then, for the next two or three years, students study beginning algebra at a pace that is slow and thorough. Most also learn geometry alongside algebra. By the time they reach high school, nearly all are ready for higher mathematics. Some may wind up going down a vocational or technical track rather than college prep, but that sorting process occurs after Algebra 1 and Geometry have been covered.

"In Asia, in Europe, it is so much more sensible and humane. The students have time to really absorb the material," Schmidt said.
"Here, people are just plopped into algebra, and they end up struggling all year. It is only the brightest kids in mathematics who are able to make this abrupt shift. That's why algebra is considered such an elite course."

That stigma could be on its way out in California.

In the state's new math standards, algebra turns up in kindergarten as a major theme. Although children may not hear the "A"-word for several years, the standards recommend that young minds be exposed from Day One to algebra's earliest concepts.

"Algebra and Functions," the standards say at kindergarten: "Students sort and classify objects. Which pencil is longer? Describe how the following two objects (a big button and a little one) are the same or different."

In second grade, students are to be taught the "commutative rule," although they may not be given that mouthful, per se. Instead, they might be asked to draw pictures using dots to show why 11 plus 18 is the same as 18 plus 11.

By fifth grade, the infamous x comes along. "Use a letter to represent an unknown number," the standards say.

In sixth, there are linear equations. "6y -- 2 = 10. What is y?" the standards suggest.

The standards are unflinching in their algebraic march. After seventh grade, they include no more "grade-level" recommendations. Instead, they outline standards for specific math disciplines, starting with Algebra 1.

No one expects eighth-grade algebra to happen everywhere, overnight. It will take years to get the books lined up, the standards in place and the teachers trained for the task.

In the meantime, middle schools will be what they are now -- an algebraic hodgepodge. Some, such as Spring View, are gradually adding algebra classes. Others are taking a more aggressive approach, placing every student into algebra, with mixed results.
When the superintendent of the Los Angeles Unified School District dictated in 1995 that all middle schoolers take algebra, it was a disaster that led to a giant bump in the district's algebra failure rate.

Closer to home, Arden Middle School in the San Juan Unified School District began offering algebra in two forms -- a one-year class and a two-year class for those needing or wanting more time. Last year, every seventh- and eighth-grader at Arden was placed in some sort of algebra class. It was a move that proved too ambitious for some, Principal Lynn Jacoby said.

This year, Arden Middle took a step in a different direction and opened what it calls "corrective" math courses for students not ready for algebra.

The vast majority of seventh- and eighth-graders remain in some form of algebra, Jacoby said. Those who need more support are assigned to a math-tutorial class to take alongside algebra.

"When our students leave here, they may not all be ready for the next level of math," Jacoby said. "But the majority will have had some algebra by the time they get to high school."

With all the focus on algebra in middle schools, there is no question more eighth-graders will master it. But the ultimate burden of getting everyone through it still lies with the high schools.

"It is forcing us to change everything we do," said Keith Calandri, coordinator of secondary math and science in the Sacramento City Unified School District.

Most local high schools have dropped all "general math," "consumer math" and "business math" courses, which basically were grade school arithmetic disguised for high school consumption. In their place, schools have opened algebra sections by the dozen, many of them two-year courses designed for students who need more help and time.

In addition, schools offer extra math tutoring sessions after-hours, on Saturdays and during the summer.

For some high school students, the no-escape clause on algebra is tough. But when the subject finally starts clicking in their minds, it can be satisfying and even fun.
Joseph Montgomery and Justin Valenzuela, juniors at Laguna Creek High in the Elk Grove district, are taking beginning algebra for the second time because they earned D's last year. Both have had a change of heart about the subject.

Montgomery wants to become an officer in the military, and even though he is not sure exactly how he will use algebra, he knows he needs it for his future.

"I have to admit, I kind of like it now that I am understanding it better," he said.

"It's my favorite class now," said an enthusiastic Valenzuela, who credits his teacher, Tami Cooper, with helping him understand and enjoy the class. "I'm getting B's, and I might even get an A this time."

To Cooper, such words reach deeply into her soul. Elk Grove's 1999 Teacher of the Year, she's an algebra whiz and a passionate believer in kids.

There was a time in her life, back in eighth grade, when she couldn't handle algebra either. She felt bad and dropped it.

When she enrolled again in ninth grade, she went to her teacher with an age-old lament. "Why," she asked, "do I have to take this?" The teacher gave her an age-old reply, "It will teach you to think."

Twenty-seven years later, Cooper remembers those words and passes them on to her students. If they fail the first time, it's OK, she tells them. They'll get it eventually.

She likens this business of algebra to learning to ride a bike. Some kids get on and ride right away. Others fall and fall until finally they figure it out.

"If we don't put them on the bike and make them try," she said, "they'll never ride."