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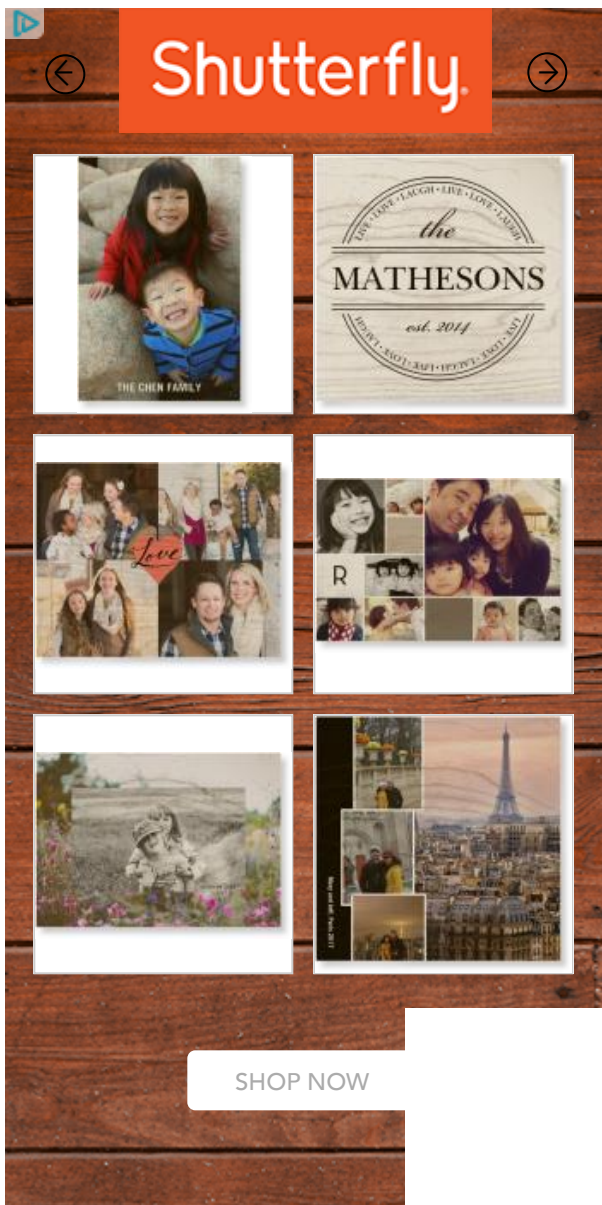
# Community-college students learn math by using it



Originally published April 6, 2015 at 5:00 pm Updated March 18, 2016 at 10:37 am



**1 of 14** Jason Broad and Yalchen Abdulkhaliq work on making a scissors clamp in the machine shop during a class at Shoreline Community College. Machining requires students to have a solid understanding of algebra,... (Mike Siegel / The Seattle Times) **More** ▾



**Washington's 10-year-old I-BEST program is a groundbreaking approach to teaching community-college students who need help catching up in math, reading and writing, and it's been widely copied around the country.**



By [Katherine Long](#) 

*Seattle Times higher education reporter*

The grinding sound of metal on metal filtered through the walls of Chris Lindberg's math class at Shoreline Community College, but his students had no trouble tuning out the noise.

"We've got a 10-inch-diameter grinding wheel, and it's turning at 1,910 revolutions per minute," Lindberg said, jotting the numbers on a whiteboard. "What is the surface

speed?”

The six students clicked away on their calculators to solve this fairly basic algebra problem, similar to the kind covered in high-school classes.

But this is no ordinary algebra class.



[Education Lab](#) is a Seattle Times project that spotlights promising approaches to some of the most persistent challenges in public education. It is produced in partnership with the [Solutions Journalism Network](#), a New York-based nonprofit that works to spread the practice of solutions-oriented journalism. Education Lab is funded by a grant from the Bill & Melinda Gates Foundation. [f](#) [t](#)

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In the most-copied idea to come out of Washington’s community-college system, these students are learning basic math without having to take months — or years — of basic-skills classes for which they would earn no college credit.

Instead, they were catching up and earning credit at the same time, working toward a credential that can lead to jobs that pay between \$15 and \$35 an hour.

They also were learning algebra they will use — not years from now, but right away, when they go into the noisy shop next door, setting up complex lathes and milling machines, each the size of a small SUV.

Ten years ago, a handful of Washington community colleges piloted this approach as a way to boost the dismally high number of students who then were leaving before earning a credential, or even a single college credit. Called I-BEST (Integrated Basic Education and Skills Training), the program has been so successful that it's now used at all 34 of Washington's community and technical colleges, and has been copied by colleges in 29 other states.

I-BEST students are nine times as likely to earn a workforce credential as students who follow the traditional path of taking remedial classes first.

Even students like 25-year-old Troy Briones, who, by his own account, struggled in high school with fractions and other basic math concepts.



After a stint as an Army field artilleryman, the 25-year-old is back in Washington, training to be a skilled machinist, a high-demand job that can pay up to \$35 an hour.

“Math is everything in machining,” he said. “I didn't really know it, until a couple weeks into it — everything is math-related.

“The best part of the program is it's very hands-on. As soon as the lecture ends, you go straight into the lab and try it ... the instructors are with you every step of the way.”

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**Unprepared**

**Editor's note**

*A large percentage of students must take remedial classes in community college, which is one reason so few students complete degrees or career credentials. Washington state's colleges, however, have developed a much better way to help students catch up and complete their programs.*

Nearly 60 percent of students who enter community colleges aren't prepared to take college-level vocational or academic classes right off the bat. And the failure rate is stunningly high: Only about a quarter of those students earn a degree in eight years.

That's true nationwide as well as in Washington, and it's not because the students flunk out.

At most community colleges, students who don't do well on placement tests must take pre-college classes in their weak subject — math, writing or reading. These classes can feel like a repeat of high school, and they can greatly extend the time and money it takes to finish a vocational or academic degree. Some students get discouraged or spend so much money on the remedial classes that they don't have enough left to finish a credential.

## I-BEST programs

Community colleges offer I-BEST programs in 14 areas: academic transfer, accounting, allied health, business clerical skills, child care and education, environmental, hospitality, information technology, law enforcement, manufacturing and production, nursing, trades, transportation, welding.

[Click here to search for a program.](#)

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Math is by far the biggest problem area, with more than half of Washington community-college students required to take remedial courses in that subject. But they often don't need an entire course of high-school math; they're just weak in some areas.

With I-BEST, basic math and writing skills are taught alongside technical skills, usually in the same classroom. The program pairs a basic-skills teacher like Lindberg with a subject expert, such as Keith Smith, the machining-program instructor at Shoreline. The I-BEST approach is being used in academic transfer classes, too, for students working on associate or bachelor's degrees.

Because it uses two instructors instead of one, I-BEST costs the community colleges almost twice as much as a conventional class. The college bears the extra expense, not the student.

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But a national study showed that I-BEST programs produce long-term economic benefits that outweigh the added costs. And a state study suggested that I-BEST benefits the entire state because the graduates get better jobs, paying more in taxes over a lifetime.

The arrangement helps students like Briones who have struggled with math, as well as older ones such as Karen Luckmann, who was good at math in her 20s and almost decided to major in the subject as an undergraduate at Central Washington University.

But Luckmann is 53 now and starting a second career after she was laid off from Boeing last year. She hasn't done algebra or calculus in decades, and she never took trigonometry — all skills she will need to become a precision machinist.

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“If you don’t use it, you don’t apply it, it doesn’t stay with you,” she said.

## Looking ahead

The beginning of I-BEST dates back to 2005, when educators with the State Board for Community and Technical College (SBCTC) became increasingly worried about the baby-boom generation of skilled workers who were starting to retire.

A lot of young people were going to need advanced training to fill those jobs, and while they were enrolling in community-college career programs, the completion rate was abysmally low.

“The truth was, our two-year system was hemorrhaging students with high-school diplomas, or less, at a pretty alarming rate,” said Jon Kerr, the board’s director of adult basic education.

The staff began drilling into its data to try to figure out how the colleges could be more effective. One of the things it learned: Students who were assigned to basic-education courses (scoring at 10th-grade level or below on a placement test) or developmental education (scoring at 11th- or 12th-grade level) were highly unlikely to ever get a credential.

They knew that a large chunk of their students — 40 percent — were working adults, and more than a quarter were raising children.

### **I-BEST’s key components**

- Students learn basic skills as part of vocational or academic classes for which they earn college credit.
- Two instructors teach each class.
- Basic skills such as math or writing are taught in the context of how they’ll be used on the job.
- There’s a clear pathway that shows which classes to take next, helping students efficiently complete a credential or work toward a degree that leads to a job.
- Students are grouped in cohorts, so they can learn from one another.

But they hadn’t fully appreciated that students who enrolled in basic-skills classes viewed those classes as a means to an end. “Their real goal was job skills to get a better job,” said Jan Yoshiwara, deputy executive director of education for the state board.

That was a big “aha” moment, she said. And that was when the colleges decided to experiment with weaving basic skills into career classes, so students could take the classes they really wanted from the start.

The state’s community-college leaders also knew, through their research, that students who completed at least a year of college-level classes and earned a credential **saw the biggest bump in earnings**. They wanted to help more of them over that tipping point.

To see what would work best, a handful of community colleges launched pilot programs in 2004-2005, which showed they were right — teaching basic skills in context improved learning retention. It makes sense: When algebra for machinists is taught just before the

students work on a metal-cutting project, they immediately apply what they've just learned, reinforcing it.

The pilot projects also showed that colleges could often accelerate the speed at which remedial math and writing are taught, just filling the gaps in students' skills rather than requiring them to repeat whole classes.

Kerr also has interviewed hundreds of I-BEST students in his role as I-BEST director and dean at three different state colleges. Many said I-BEST was the first time their teachers had made a direct connection between academic work and job skills.

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In addition, many I-BEST programs — and increasingly other community-college programs — are providing a clearer path for students to earn a certificate or degree.

In the I-BEST machinist program, for example, students know that they can earn a basic manufacturing certificate in one quarter, preparing them for an entry-level job, or they can keep going for two quarters, or up to two years, adding skills as they go to earn an associate in applied arts and sciences.

“It all starts with one principle: Start with the end in mind,” said Davis Jenkins, senior research associate with the Community College Research Center at Teachers College, Columbia University.

“If it’s a job, ask what are the competencies you need,” Jenkins said. “And create a clear path and map, and track their progress.”


Jenkins worries, though, that the higher cost of I-BEST has made it into a boutique program, not something that can be replicated on a large scale. Just 3,400 students in



Washington participated in I-BEST last year; the community colleges have a head count of 400,000 students.

However, Jenkins believes many of its innovations can be woven into traditional programs for a lesser cost, by redesigning programs into career pathways and teaching math and writing in the context of the field the student is studying.

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The lessons college administrators have learned from I-BEST's success have influenced the way they structure other programs, including academic courses for students working on associate or bachelor's degrees. And I-BEST has influenced the development of a new plan to change the way math is taught in Washington's community colleges, one that would create career pathways for students and offer different kinds of math for different careers.

## Other skills

I-BEST isn't just about math. It also helps students who need to boost writing or reading skills. Renton Technical College's anesthesia-tech program is a good example, using I-BEST practices to help students learn the vocabulary and other skills they need to aid anesthesiologists in the operating room.

It's a small, very popular program, and no cakewalk.

Students must learn the special language of medicine, rooted in Latin and ancient Greek. They must understand complex medical procedures, and be ready to hand over

the appropriate medical equipment to an anesthesiologist at the right time during an operation. They must know medicines and ratios so that they can question a dosage if it seems wrong.

Many of the students who enroll have no medical background. This year's class includes a former blackjack dealer, a flight attendant, a corrections officer and several Army veterans.

That's why instructor Gary West wanted his course to become an I-BEST program. That way, he is team-teaching with Shokouh Pardakhtim, a basic-skills instructor who majored in math at the University of Washington.

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While West teaches the procedure for inserting a central venous line with his quick wit and dry sense of humor, Pardakhtim is the quiet partner, helping students figure out drug regimes and formulas, work that involves multiplying fractions and understanding ratios. She also assists students with dense medical terminology.

Renton Tech was one of the original community colleges to participate in the I-BEST pilot. Now, the I-BEST approach is suffused throughout the entire school, and helped it become recognized as one of the nation's top community colleges this year.

At Renton Tech, about 82 percent of I-BEST students either completed a certificate or returned for another quarter of instruction in 2012-13. That's far better than the non-I-BEST rate, which is 68 percent.

But it's also typical of I-BEST across the state. In Shoreline's manufacturing program, for example, 87 percent of I-BEST students completed a certificate or returned for another quarter — compared with 75 percent of non-I-BEST students.

Smith, the machinist instructor at Shoreline, is sold on the value of I-BEST — the application of skills, the support, the approach to teaching. He believes too many students falter at math in high school because the work is too theoretical.

With I-BEST, he said, “rarely does a student go through this program and not succeed at math.”

## What's the best way to learn math?

A selection of responses, including the contributor's full name and city of residence, may be published online and in print at a later date. Your address, phone number and email are required for verification but will never be published. Responses may be edited for length or clarity.

How and when did math ever click for you? If you're a parent of a school-age child, what do you think of the way he or she is learning math?

Maximum Allowed: 250 words. *Currently Used: 0 words.*

How much math do you remember from school? Do you use it in your current job?

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