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In ‘Flipped’ Classrooms, a Method for Mastery

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In traditional schooling, time is a constant and understanding is a variable. A fifth-grade class will spend a set number of days on prime factorization and then move on to study greatest common factors — whether or not every student is ready.

If student turns in shoddy work in a ‘flipped mastery’ class, she can’t move on to the next level.

But there is another way to look at schooling — through the lens of a method called “mastery learning,” in which the student’s understanding of a subject is a constant and time is a variable; when each fifth grader masters prime factorization, for instance, he moves on to greatest common factors, each at his own pace.

Mastery learning is not a new idea. It was briefly popular in the 1920s, and was revived by Benjamin Bloom in [his paper “Learning for Mastery”](#) in 1968. It has shown dramatic success — compilations of studies can be found [here](#) and [here](#).

One of the advantages of mastery learning is that the student, not the teacher, leads — and we know that people learn far better when they are actively involved. The teacher provides materials, tools and constant support. Students set their own goals and manage their own time.

In a traditional classroom, the teacher must aim the lecture at the middle, leaving the faster learners bored and the slower ones lost.

Differentiation and personalization are big challenges. But the mastery system allows each student to learn at her own pace.

Mastery also rewards students for actual learning. A student cannot simply turn in a shoddy paper, take the D and move on. If she turns in shoddy work, she *can't* move on. She has to keep trying until she demonstrates she fully understands.

Despite these advantages, mastery learning never caught on, mainly because it was a nightmare for teachers. One problem was how to do direct instruction; a teacher can't give five different lectures in one class. The other was how to test students. Multiple versions of a test were needed so students couldn't pass them to friends who would be taking them later.

But some teachers are now reviving mastery learning. What is making it feasible is the [flipped classroom](#), a method I wrote about in my most recent column.

In a flipped classroom, teachers make videos of their lectures introducing new concepts and assign them as homework. That frees up precious class time to work directly with students on projects, exercises or problem sets — the stuff that students would traditionally do at home. Now instead, of struggling alone, students can do the most important work with a teacher or peers who can help.

The flipped classroom eliminates whole-class lecture, so students don't need to work at a uniform pace.

(Incidentally, many of those who commented in response to my flipped classroom column asked: where's the reading? The answer is: where it always was. Students still read for homework. But in a flipped classroom, they won't do problems at home any more — they'll watch the lectures instead.)

Thousands of teachers are experimenting with flipping their classrooms in elementary schools, law schools and everything in between. Jon Bergmann, a former chemistry teacher who used flipped learning and now teaches others about it, lists 15,000 members in the [Flipped Learning Network](#).

But a handful of innovative teachers are venturing further, using the flipped classroom to employ mastery learning — “flipped mastery,” as Bergmann and his fellow chemistry teacher Aaron Sams call it in their book, “Flip Your Classroom: Reach Every Student in Every Class Every Day.” Since the flipped classroom eliminates the whole-class lecture, they’ve realized, it has also eliminated the reason for students to work at a uniform pace.

Tim Kelly, who teaches math at a high school in Baumholder, Germany, which serves children of United States military families, heard about the idea when he sat next to Sams on a bus trip when they both won the Presidential Award for Mathematics and Science Teaching

When Kelly came back from the ceremony in December, 2010, he talked excitedly about flipped mastery with his colleagues Corey Sullivan and Mike Brust.

That’s crazy,” said Sullivan; it sounded radical and chaotic. “No way should we ever do that.”

But as spring approached they decided to try it. “We had some struggles with our kids,” Sullivan said. They figured it couldn’t hurt to try something new.

They worked around the clock through spring break to design the course and create materials. “We put in 40 to 60 hours outside school just for a unit,” Sullivan said — and there were 12 units per course. They had to make all the videos; such a quick switch was

only possible because they divided the work among them. (They now call themselves the [Algebros](#). They post all their lessons and materials online; feel free to borrow.)

The fourth Algebro, Spencer Bean, who also won the Presidential Award, had stuck with the traditional way. But then his daughter went through Kelly's flipped mastery Algebra 1 class, and he was converted. "Here I am with this award and I'm going to throw away everything I've been doing that I just got an award for," he said.

Setting up a flipped mastery class is a second full-time job, and the method can also demand more teacher time before and after class to make sure every student gets personal attention. But teachers also say that it saves them time on the paperwork. Tom Driscoll, who uses flipped mastery to teach history at Putnam High School in Putnam, Conn., notes that he no longer has to write daily lesson plans.

Another advantage: less (or no) student work to grade at home. "We stopped grading papers in the sense of taking them home and having stacks and feeling guilty for not doing them," said Bergmann. "Everything they turned in we went over in class. There's a lot of teaching in the grading process." After the student takes the test or turns in a project designed to demonstrate mastery, the teacher sits with the student and goes over the work, providing immediate feedback. Bloom called this formative assessment. (There's no reason teachers couldn't do this in any classroom. But it's far less feasible when 30 kids are taking the test together.)

"There's my one-on-one time with students," said Brian Gervase, who uses flipped mastery in his pre-calculus class at Downers Grove North High School in Downers Grove, Ill. "Let's look over

the work together and make sure you understand this particular skill.”

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A typical day in a flipped mastery classroom usually starts with a brief group activity and poll: who needs extra help or is ready for a mastery check?

Then the noise begins — “a 10-ring circus,” Bergmann and Sams call it. “Kids are coming at you all day long,” said Kelly. “The first day, I got dizzy a couple of times.” Driscoll made a three-minute video version of a typical class, which you can see [here](#).

Some teachers offer students a menu of learning activities to choose from, and another menu of ways to demonstrate mastery — that way, a student who does not test well, for example, could still show her understanding. Driscoll allows students to complete three from a list of choices, including writing an essay, giving a speech, having a debate or designing a video game.

In math, multiple-choice tests are more common. Bergmann uses Moodle software, which creates at random a different test each time from a pool of questions the teacher writes in advance (here is a [tutorial](#) on using it). A student who can’t show that she grasps the concepts must do more work and then retake the assessment.

Driscoll structures his class like a video game — it’s a post-apocalyptic 2045, and students have to study different civilizations to come up with a way for society to rebuild itself. “You have to complete certain ‘missions’ to move to the next level — some are teams, some are solo,” he said. Sound corny? “Engagement has gone through the roof,” he said. (Driscoll and

his fellow Putnam social studies teacher Brian Germain have a lot of creative ideas — their Web sites are [here](#) and [here](#).)

It is too early to have formal proof of the effectiveness of this iteration of flipped mastery, and its use is still too limited. (The Flipped Learning Network [forum on mastery learning](#) currently has 267 members.)

But teachers who use flipped mastery claim that its efficiency allows most students to do a year's work in much less time. They build in extra units for advanced students or work with them on independent projects.

They say it's also a better way to teach slower learners, giving them more teacher attention and personalized instruction. Kelly said that at Baumholder, the math department tries to put struggling students in the flipped mastery class. "As soon as we flipped, we noticed that students' focus really improved," said Kelly. "Math teachers get some really bad grades, but that doesn't happen anymore. Maybe it takes longer, a little more practice, but they can do it. They're not bombing."

"Before, some kids would do the minimum amount of work possible," said Bean. "They'd get by with a C-. Now they know they have to master it to be able to move on. The same kids stay after school to work with me on assignments."

The truly struggling students might not get through a year's material. But Brust notes that in a traditional class, they would be learning far less. "A kid who got a D would pass, but he was set up for failure for the rest of his career," said Brust. "Now it may take longer, but when you're done you have a solid foundation."



Tina Rosenberg won a Pulitzer Prize for her book “[The Haunted Land: Facing Europe’s Ghosts After Communism.](#)” She is a former editorial writer for The Times and the author, most recently, of “[Join the Club: How Peer Pressure Can Transform the World](#)” and the World War II spy story e-book “D for Deception.”