Turning Education Upside Down

Three years ago, Clintondale High School, just north of Detroit, became a "flipped school" — one where students watch teachers' lectures at home and do what we'd otherwise call "homework" in class. Teachers record video lessons, which students watch on their smartphones, home computers or at lunch in the school's tech lab. In class, they do projects, exercises or lab experiments in small groups while the teacher circulates.

Clintondale was the first school in the United States to flip completely — all of its classes are now taught this way. Now flipped classrooms are popping up all over. Havana High School outside of Peoria, Ill., is flipping, too, after the school superintendent visited Clintondale. The principal of Clintondale says that some 200 school officials have visited.

It's well known by now that online education is booming. You can study any subject free in a MOOC — a massive open online course — from single-digit addition to the history of Chinese architecture to flight vehicle aerodynamics. Courses are being offered by universities like Harvard and M.I.T. and by the teenager next door making videos in his garage. Among the best-known sources are the Khan Academy, Coursera and Udacity. But while online courses can make high-quality education available to anyone for the price of an Internet connection, they also have the potential to displace humans, with all that implies for teachers and students.

Like everything disruptive, online education is highly controversial. But the flipped classroom is a strategy that nearly everyone agrees on. "It's the only thing I write about as having broad positive agreement," said Justin Reich, a fellow at the Berkman Center for Internet and Society at Harvard who studies technology and education.

Flipping is still in the early stages, with much experimentation about how to do it right. Its most important popularizers are not government officials or acade-

mic experts, but Aaron Sams and Jonathan Bergmann, a pair of high school chemistry teachers in Woodland Park, Colo., who wrote a book called "Flip Your Classroom: Reach Every Student in Every Class Every Day," drawing almost completely on their own experience. It hasn't been rigorously studied (most people cite only this one research paper.) Flipping's track record in schools, while impressive, is anecdotal and short. But many people are holding it up as a potential model of how to use technology to humanize the classroom.

No school has taken flipping as far as Clintondale. It began because Greg Green, the principal, had been recording videos on baseball techniques and posting them on YouTube for his 11-year-old son's team. Recording the content allowed kids to watch the videos repeatedly to grasp the ideas, and left more time for hands-on work at practices.

It gave him an idea, and in the spring of 2010, he set up an experiment: He had a social studies teacher, Andy Scheel, run two classes with identical material and assignments, but one was flipped. The flipped class had many students who had already failed the class — some multiple times.

After 20 weeks, Green said, Scheel's flipped students, despite their disadvantages, were outperforming the students in the traditional classroom. No student in the flipped class received a grade lower than a C+. The previous semester 13 percent had failed. This semester, none did. In the traditional classroom, there was no change in achievement.

Green drove to Okemos, outside Lansing, to meet with TechSmith, a company that made the screen capture software he used for his baseball videos. "I want to do an entire school," he said. They said that no one had ever done an entire school.

"We have nothing to lose," Green said.

It was true. The school had been designated as among the worst 5 percent in Michigan. That year, more than half of ninth graders had failed science, and al-

most had half failed math. Using TechSmith's software — donated by the company — to make videos, Clintondale's ninth-grade teachers flipped their classes.

The results were dramatic: the failure rate in English dropped from 52 percent to 19 percent; in math, it dropped from 44 percent to 13 percent; in science, from 41 percent to 19 percent; and in social studies, from 28 percent to 9 percent.

The next year, in the fall of 2011, Clintondale flipped completely — every grade, every class. "On average we approximated a 30 percent failure rate," said Green. "With flipping, it dropped to under 10 percent." Graduation rates rose dramatically, and are now over 90 percent. College attendance went from 63 percent in 2010 to 80 percent in 2012.

Results on standardized tests have fluctuated; they went up in 2012 and then dropped. But state education officials note that last year Clintondale had a large influx of students from Detroit, many of them from low income families (standardized test scores of poorer students tend to be lower). Three years ago 64 percent of Clintondale students were low income, and now 81 percent are. Also due to an accounting quirk, some high-achieving students had their most recent test scores counted as part of a school consortium, and not as part of Clintondale.

Flipping a classroom changes several things. One is what students do at home. At first, teachers assigned 20-minute videos, but they now make them shorter — six minutes, even three minutes. That promotes re-watching. The school also uses audio files and readings as homework, and uses videos from the Khan Academy, TED and other sources. Many students do not ask questions in class, worried they will look dumb. But they can watch a video over and over without fear.

Jahya Dunbar, a junior, said her mother watches math videos with her. "She likes the idea of the technology," she said. "When I ask questions, she can un-

derstand it."

"Whenever I had a problem on the homework, I couldn't do anything about it at home," said Luwayne Harris, a senior. "Now if I have a problem with a video, I can just rewind and watch it over and over again."

Especially in low-income communities, some students don't have access to the tech they need to watch videos. Students I talked to said that about 10 percent don't — but they easily watch at school. Just because students can watch, of course, doesn't mean they do watch. (See the discussion page here for teachers' advice on getting students to do homework.)

Robert Townsend, who teaches ninth-grade physical science, gives students a week to watch a package of videos and requires students to do brief online quizzes about the videos or take notes to show to him in class.

Getting students to do homework is not, of course, a problem exclusive to flipping. Students who don't watch videos are even less likely to do traditional homework problems. They may have no support or help at home or live in a chaotic house. If they get stuck on the first problem they are out of luck. Townsend said that while only half of his students did traditional homework, 75 to 80 percent watch the videos. "It's always available to them," he said. "They're used to watching. It's the world they live in. We're meeting them on their ground."

Salman Khan, founder of the Khan academy, makes a good point in his book, "The One World Schoolhouse": If students are going to skip homework, it's far better to miss watching a video than to miss doing the problem sets.

This is the second and far more important shift that comes with flipped classrooms: it frees up class time for hands-on work. Students learn by doing and asking questions — school shouldn't be a spectator sport. "A lot of people think it just has to do with technology," said Kim Spriggs, who teaches business and marketing. "It's actually more time for kids to do higher-order think-

ing and hands-on projects. Instead of presenting the information in class and having students work on projects at home, where they don't necessarily have support, here in class, one-on-one or in small groups, I can help them immediately." Students can also help each other, a process that benefits both the advanced and less advanced learners.

Flipping also changes the distribution of teacher time. In a traditional class, the teacher engages with the students who ask questions — but it's those who don't ask who tend to need the most attention. "We refer to 'silent failers,' " said Spriggs. "Now it's a lot harder for students to hide. The teacher can see pretty much where every student's understanding is and how to help them. It's a huge difference for students who didn't seek out extra help and attention — who just sit back and keep silent."

Clintondale's experience indicates that the biggest effect of flipping classrooms is on the students at the bottom. "It's tough to fail a flipped class, because you're doing the stuff in here," said Rob Dameron, the head of the English department. "I used to have about a 30 percent failure rate in English – these kids come in a lot at third-grade, fourth-grade reading levels. Now, out of 130 kids, I have three who are failing — mostly due to attendance problems."

Townsend said he has seen big improvements in failure rates and in class discipline, but not in grades. "Before my average test score was D+ — now it's C or C+," he said. (Other teachers had a different experience, and indeed, science is the weakest subject for students at Clintondale, and across the state as measured on standardized tests.) He said he is now redoing his video lessons and adding online discussion to try to incorporate more critical thinking.

The flipped classroom is a new experience for students — but also for teachers, who are going from "sage on the stage" to "guide on the side," as many education writers put it. For good teachers, that's liberating. "I have a YouTube video on subject-verb agreement that has 54,000 views," said Dameron. "I don't *want* to give that lecture every year."

Townsend said he feels like an "educational artist" who doesn't just talk and hand out sheets. "I can create interactive lessons and exciting content. There's so much more time to educate!"

Flipped classrooms require more creativity and energy from the teacher. "You are off your chair the entire hour and walking around," said Dameron. "Lots of teachers who aren't really good teachers are resistant to this — they like to build time into the day when kids are working to do their taxes or catch up on email.".

The most serious critique of the flipped classroom is that it's not a big enough change. One variation that goes further gives students more responsibility for their own learning, while personalizing education — meeting each student at her own level. In my next column in two weeks, I'll report on this and other ways teachers are using the flipped classroom.

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