

# DOINGWHATWORKS



Video

FULL DETAILS AND TRANSCRIPT

## Mastery Over Time

Kettle Moraine High School, Wisconsin • March 2008

Topic: How to Organize Your Teaching

Practice: Spacing Learning Over Time

### Highlights

- Teachers in this math department emphasize student mastery of skills and knowledge over time by spiraling curriculum to create multiple opportunities for students to learn key concepts.
- Review of previous topics is incorporated into all homework assignments, class lessons, and assessments.
- Students are expected to retain information throughout the course of the year and cannot ignore areas of struggle by waiting for the particular unit to pass.
- The review-based curriculum has proven successful with students who normally struggle with math by providing constant support to understanding and retaining material.

### About the Site

Kettle Moraine High School

Wales, WI

## Demographics

96% Caucasian

2% Hispanic

1% African American

1% Asian

10% Special Education/Disabled

4% Eligible for Subsidized Lunch

99.6% English Proficient

Mathematics teachers at Kettle Moraine High School adopted a new curriculum in 2004 to promote student mastery of concepts over time and to target support for students who typically struggle with traditional algebra and geometry programs. Distinctive features of the department's new approach to mathematics include:

- Requiring students to explain their thinking and process for solving problems, both orally and in writing
- Use of manipulatives, visuals, and real-life scenarios to make abstract mathematical concepts more concrete
- Alternating worked problems with student practice when introducing new material
- Use of daily quizzes to review topics introduced days or weeks earlier
- Homework sets and tests designed to include at least 50% review topics
- Spiraling curriculum where new units build on concepts from previous units, and even previous courses
- Math Lab staffed by teachers throughout the day to support struggling students and strategic review of material

## Full Transcript

Charles Willems: I incorporate review into my class by having daily warm-ups, and the first thing the students do in class when they come in is work on two or three problems, and that allows me some time to walk around and check their homework assignment from the previous night, and those problems deal with the variety of topics. So right now, we are studying quadratics, graphically parabolas. But the review topics might go back to finding equations for lines or finding the point of intersection of two lines, things we did in the previous two chapters. And they also might just go back to what we did let's say the day before, so it is very much related, but just to kind of build up to what's coming that day itself.

Mike Comiskey: One of the ways that I incorporate into my Geometry class, say, which is the course after Algebra, is to bring in a lot of Algebra topics into the Geometry problem. So you might have a triangle and you are trying to find the measure of all of the different angles, and there will be algebraic expressions

in each of the corners of the triangle, and students should know that those add up to 180 degrees. So, it becomes a simple linear Algebra problem to solve for  $X$ ; at the same time, they are reviewing the Geometry idea. And this happens quite a bit also in their homework, where they're expected to know things from previous courses or previous chapters as you incorporate new material, especially true in Geometry.

Willems: So, we've all set up, every math teacher set up in their homework that most every question is review. There might be just one question or two that's from the day's topic. Most everything goes back to what we learned a day before or a week before or three months before, so they are constantly reviewing. And then, that builds into all of the tests that we write. And as teachers, we sit down; all the teachers sit down together and write the test. Geometry teachers do the same things for their courses. And the review part of that is that at least half the test is going back to covering previous chapters. And so, we are constantly reviewing in there as well.

Comiskey: And we find that at the end of the semester, whereas in a typical traditional class, you have to sort of have a week and a half of cram for semester time. We can spend a couple of days to just kind of give them an outline of "Look, this is where we have been." Now, you had homework and different review topics on this. We've been talking about all these things all the time. And we don't find that we have to play catch-up a lot and remind them "Oh, in February, remember we did that thing." In May and June, it's still fairly fresh because we have been cycling it around and around. And what we find is that the risk of them not getting it at the end of the chapter when it was first introduced is decreased for students then. They don't have to necessarily get it in an eight-day span. They might blow it the first time they take that question on that new topic eight days after it was introduced. But, then, another 20 days later, they are going to see a similar question on that topic and now we hope because we have been reviewing, because it's been in the homework, that now they have got that concept.

Willems: And what I really like about the homework, the way we have it set up, the fact that almost every question is review, is that students don't fall in this trap where in class, they understood everything I was saying and then got home to work on 40 problems of the exact same type and they forgot and couldn't do anything. They're always going to have some success by going back and doing some of the problems that we've discussed in previous days because that's what they are seeing in their homework. Really makes them feel a lot more confident, too. I think of parent/teacher conferences that we've just had last week and a comment from a parent, and her daughter actually had Algebra last year at our middle school, and it didn't go so well. And so she took it again this year, which is a wise thing to do, and the mother's comment was, it's all making sense this year, it's all the visuals that you are doing, the hands-on manipulatives, and all the reviews spiraled in is really helping her to actually understand all the things that we are doing, all the concepts, and she is acing it right now.

Comiskey: And I am finding that in my Geometry class, I have some of those freshmen that succeeded reasonably well in Algebra and, yet, they are into Geometry now, still struggling a little bit with some of

those Algebra topics. And by hitting it with some frequency, they are strengthening those skills. So when they go to the next course, it won't be such a cold shower of "Oh, what's all this stuff I don't remember from my 8th grade year." It will be a two-year gap there between Algebra courses. So, yeah, we are fairly confident that that's something that will help them move on to the next course. Their constant review and quizzing is important because of this mastery over time idea. Traditionally, math courses assume that you are going to again need sort of that two-week window in which you are going to presumably learn everything. And for those of us who are math teachers, we probably were able to succeed in that world. You know, we liked math, we did it, and we succeeded and in two weeks, we could learn it and take a good test. But for many students who don't get it right away, but that successive review and even successive tests will help them sort of master it over time, and I think that review builds into that.

One of the beauties of the spiraling curriculum is that it really requires students to not give up on a topic that traditionally they might have been able to work their way through as best they could and then it would fall away and never to be seen again—maybe one question on the final exam, but I will blow that one and that will be okay, too. And with the spiraling and with the review that's built into the new material all the time, students who never really master a topic that will come up again and again, and in some ways, it will require them to really work through their struggles with it, or it will prevent them from really getting onto the next topic. Compared to other text that I have taught out of our other approaches, you could let topics fall away and still end up with a B in the class or a B+, I mean, you could still be a successful student never really having learned how to do that one thing, and that's pretty hard to do in this setting.

Willems: And I think we really believe here at the school that mastery will take place over time. It's not going to happen in the one-day lesson. And for some students, it might; but for most, it is not going to and it might take some students a month or two to finally master something. But they get these chances over and over in practice, in homework, then again in test to eventually, nail the material.