

National Research Center for Career and Technical Education

The Math-in-CTE Curriculum Integration Model: An Introduction to the Video Series - A Webinar with Representatives from the NRCCTE and Case Studies from Arlington, VA and Oregon

Kirsten Sundell: This is Kirsten Sundell. I'm the Communications Director with the National Research Center for Career and Technical Education, and last year I had the great pleasure and privilege of visiting three sites in Arlington, Virginia; Detroit, Michigan; and Oregon to talk with principals, Math-in-CTE teachers and students about their experiences using the Math-in-CTE model, what it's really done for them in their classrooms and their schools. The outcome of these visits was our series of videos, which you can watch on our Web site, www.nrccte.org. We have participants in those videos here with us today to talk about those experiences, sharing a little more about the model, and we're going to get started with an introduction from Donna Pearson, who's an Associate Director here at the Center, and also a co-PI on the original Math-in-CTE study, as well as Mary Fudge, the lead Math-in-CTE facilitator for the National Research Center. They're going to talk a little bit about the model, giving an introduction to it if you're not already familiar with it, and then we're going to get into presentations from two sites, and that would be Arlington Public Schools, Arlington, Virginia, and folks from the Oregon Department of Education and Lane Education Service District. So I'm going to hand this over to Donna, who's going to start us out.

Donna Pearson: Thank you, Kirsten. Again, I'm Donna Pearson. I'm the Associate Director for the National Research Center for Career and Technical Education, and I was also an original researcher on the Math-in-CTE study. And with me is Mary Fudge.

Mary Fudge: I'm Mary Fudge, and I have a background in mathematics and CTE. I worked on the original study in Michigan working with the health teachers, but I have about 20 years experience as a math teacher in a CTE center.

DP: And Mary also has considerable experience and deep experience in math and academic integration, and that's why she was originally brought onto the Math-in-CTE study as one of our co-researchers and site directors during the study. We are going to start with a little bit of an introduction. We're anxious to get to our guest presenters, so we're going to make this brief, but we hope it will help those of you who haven't heard of the Math-in-CTE model to understand it a little bit better.

Actually the Math-in-CTE model began as a research study. We conducted this study from 2003 to 2005. We tested over 3,000 students. We provided professional development to over 130 teachers, which included also math teacher partners in the process, and we tested the model in multiple CTE content areas.

We asked a relatively simple question for this study. We wanted to know if enhancing the math that naturally occurs in CTE curricula could actually improve the mathematic skills of our CTE students, and we found out a resounding yes. If you would like to learn more about the research studies, you will find them on our NRCCTE Web site, so we invite you to visit there and read about the pilot study and also the full study.

Since we found the model was successful, we began technical assistance to states and large districts in 2006, and since then we've been able to provide professional development to hundreds of teachers across the United States and impact the life of thousands of CTE

students. We often are asked what makes Math-in-CTE work. We know that it raises the mathematics scores of our students, but actually what makes it work, we call these the core principles of integration, and you'll hear a little bit more about these from some of our guest presenters as well.

The first core principle of the five is what we've learned from our teachers, and that is the importance of fostering and sustaining a community of practice. The idea here is that we have teams of committed teachers working together over time to develop math enhancements, to share those, to critique them and to implement them into their classrooms.

The second core principle is the notion that we begin with the CTE curricula and not with the academic curricula. In other words, we're not going to superimpose math into the CTE content. Instead, we're going to start with the CTE content and we're going to look for those natural intersections of mathematics and CTE, and we're going to let those enhancements bubble out of the CTE curriculum. Mary?

MF: One of the other things of the core principles is understanding that academic skills are essential to the workplace. Mathematics is a tool that they take with them to their CTE program and on into the workplace to help them to do the job that needs to be done.

And also one of the principles is to maximize the math in the CTE curriculum. And how we do that is as teachers go through the year, they become more aware of the mathematics that is in their curriculum, and it seems to kind of jump out at them a little bit. And so they seize that opportunity in that moment to emphasize that with their students, to make them aware that that is really mathematics that they are doing. And then we recognize that CTE teachers, they're not math teachers, but they're teachers of academics in CTE. So they can teach the math that's inherent in there, but we're not trying to make them into math teachers.

DP: Thanks, Mary. We also like to present Math-in-CTE as a process and a pedagogy. It is often misunderstood for being a curriculum. It's not a curriculum. It's a process and a pedagogy through which we enhance the math that naturally occurs in our CTE curricula. So the process that we use, and I've highlighted the important aspects in red here for you, we offer extended professional development. We work with teachers and teams of teachers over time. We engage them in curriculum mapping and lesson creation. We'll go back and improve and revise those lessons throughout the year and create even more. Throughout the year our CTE teachers are also partnered with our math teachers from local schools or in the same school they're at, and those math teachers provide ongoing and direct math support throughout the year.

We also offer a pedagogic framework that we call the seven elements of a math enhanced CTE lesson, and we'll address that in a couple of slides. But right now I've asked Mary to talk a little bit more about the important role of a math teacher partner in this process.

MF: The math teacher partner serves as a coach to the CTE teacher. They don't actually write the lesson and they don't go teach any of the lessons nor do they go co-teach the lessons. They help identify the math that already exists in the CTE curriculum. They explain the math vocabulary. Many times the CTE teacher does the math process, but they don't understand the correct vocabulary that goes with it and sometimes they don't understand the correct math processes and procedures to do it correctly. So the CTE teacher works as a partner to coach them through all of these processes as we go through the procedures.

DP: The model was originally tested for CTE teachers to use in their own classrooms, but through our study and also over the years of our technical assistance we've come to understand the benefits that this model has for our math teacher partners.

MF: The math teachers learn about the application of math in CTE classes. For most math teachers, having the application right at hand for them is so very beneficial because they're teaching procedures in their classroom and they don't have ready access to authentic application to answer that common question from students of "when am I ever going to use this?" So the math teacher is able to effectively explain that relevance of math (inaudible) and for their students those authentic applications.

DP: Thanks, Mary. A common misunderstanding of Math-in-CTE is that it is a set of lesson plans, and if there's anything we learned out of our study from our teachers is that this is not a set of lesson plans. This is truly a process and a pedagogy, and that process begins with examining the CTE curricula for that intersection of mathematics and CTE content. So we actually began professional development with our teachers using this curriculum mapping process. It's not the same as cross walking. Mary will explain that in a few minutes. But we really want to look at the CTE curriculum that we're teaching and ask ourselves where does the math naturally occur, where are there opportunities to enhance math in this curriculum? And this is an ongoing process of our community of practice of teachers. It's not just a one-time event of mapping, but we often go back to those maps over and over because as the teams grow with the model, they begin to see math everywhere and they begin to see more and more opportunities for integration, so we'll revisit and revise those maps often as we go along.

Mary, would you explain a little bit about the mapping process here?

MF: Sure. We start with the CTE unit or topic, and I have a sample of a Health Occupations map up here on the screen. So, for example, Human Structure and Function would be one of the units in the Health Occupations program. We then ask teachers to identify what are the CTE concepts that are taught within there. So one example would be teaching on cell, tissue, organ and body systems and relationships. Then we ask them to sit and talk with their math teacher to talk through what they teach in that unit. And as they're talking through that, we ask the math teacher to listen for those math intersections, and to identify what that math is in there. Now many times the CTE teacher won't give it in math terms, so the math teacher has to probe and ask questions so that they can pick out where that math is. In this particular unit, some of the math that was identified is solving linear equations, reading and interpreting graphs and charts, problem solving involving statistical data, and ratio and proportion. So we find that there's a wide variety of math in the unit and it's not specifically all in one area of mathematics. It could be totally across the math curriculum.

DP: You'll see an empty column on the right-hand side of this map. Mary, do you want to explain a little bit about what that empty column is?

MF: Right. As a center, we crosswalk to the Common Core math standards. But we will also work with any state or district to use whatever standards they're using in their district. Most states are now going to the Common Core, so it's being pretty consistent. But there are four or five states who still have their own, and we will crosswalk to whatever standards that they want so that that will help them to identify the math standards that really are in that curriculum.

DP: So you can see on this mapping model that we don't start with the Common Core, but we end up there. We actually start with the authentic mathematics that occurs in CTE and

then we map backward later to whatever set of standards a state might be interested in using.

Once we've mapped, the teacher teams come together and they look at this map and they ask themselves, where now do we want to begin to develop enhanced lessons in this curriculum? And once they decide what is worthy of enhancement, we give them a seven-element framework by which to create their lessons. There are several important aspects of this framework, but one important aspect here is that we never make it a math lesson. It's always a CTE lesson. So we begin with an introduction to the CTE lesson. And then we end in elements six and seven, as you can see on your screen, with bringing it back to the CTE so that students can demonstrate their understanding, what they know and are able to do, both in the CTE and the mathematics, and then we offer formal assessment in both CTE and mathematics, never leaving the CTE context.

The internal aspect of this framework, though, that's very important in elements three, four and five address transfer of learning. Here is where we teach our CTE instructors to identify the imbedded example. So whatever math naturally occurs, we ask them to identify it exclusively to the students and walk them through it, walk through the example. Then we ask the teachers to develop other related contextual examples. This extends the learning of the students, and it's the same mathematic principle that is in the embedded example, but they are just simply other examples that give them practice. And then finally we extend their learning so that they can see what this map looks like in a traditional mathematics classroom. So here you have the seven elements through which we help teachers develop a math-enhanced CTE lesson.

As we transition now to our site guests—our leaders and our educators who have joined us today, we want to leave you with a final thought. We think of this as changing the paradigm and how we practice and how we teach CTE. In old models, professional development may have been in training, little training segments. We may have distributed boxes of curriculum, and we assumed that individual teachers could do the job once they got back. In this new model of implementing integration, it's a process and not an event. It involves communities of practice and emerging teacher leaders. It involves ongoing support and teacher development. And it involves teams of committed teachers working together over time. This is really what is the heart of the success of integration.

And having said all of that, thank you for your time, and I'm passing the baton now, I believe, to Arlington.

KS: Thanks, Donna. This is Kirsten again. It's my pleasure to introduce our panelist from the Arlington Public School System in Arlington, Virginia. And kicking things off for us from Arlington is Jim Egenrieder, who's a STEM Education Specialist for the District. He's going to introduce his fellow guests, and take it away. Thanks, Jim.

Jim Egenrieder: We're going to begin with some history. Let me first just tell you who's on the call with me. I'm Jim Egenrieder. I'm the STEM Education Specialist. I was both an agriculture teacher and a life sciences teacher in Arlington Public Schools. Our Director of CTAE, Kris Martini, is on the call. We're hoping that Jeff Elkner can join us as soon as his class is out. And the same with Isaac Zawolo, although he has an unexpected family event to attend to. Mr. J.C. Parry is here with us today as well.

So I'll progress to the next slide and tell you what we'll talk about. We're going to give you a short history of our involvement in Math-in-CTE and tell you a little bit about the context in which we apply it here in Arlington, Virginia. Then we'll talk about strategies for smaller

school-division-level implementations like ours, although we've now expanded into our neighboring counties in northern Virginia. Then we'll talk about some of the tools that we use that perhaps initially were uncommon or unique but I believe are used by others. And then we'll hear from a CTE teacher and his perspective, and then a math teacher and his perspective. And we'll then share some of our outcomes. I'll also tell you now on this slide, if you look at that link on the bottom you'll see that you can download these slides, or open these slides on your own and make a copy. I also just pasted it into the chat link so you don't even have to copy anything, you can just click on it and it should open for you.

Now, let me ask our Director, Kris Martini, to guide us through the history of our involvement and the context in which we apply it.

Kris Martini: Thank you, Jim. Good afternoon everybody. We first saw the Math-in-CTE program at the American Youth Policy Forum meeting in Washington, D.C. After seeing it at the Forum, we started looking at becoming, or putting in a grant to become a Governor's Career and Technical Academy, a STEM academy here in Virginia. As we were going through that process, we were looking at ways that we could go ahead and get our teachers to start looking at STEM and integrative STEM education, and we were also looking at staff development or professional development for our teachers. I went to the Jumpstart program in the fall in North Carolina with one of our math specialists, also two teachers, a CTE teacher and a math teacher. And during that Jumpstart program I was really amazed to see how engaged the teachers were, as we were developing and going through kind of a very shortened version of the process. We brought that back and as we started talking about it, we thought that this would be a good program to help our teachers with the professional development they needed to really start looking at how we can integrate math into our CTE program, and not really making math the central point but having our career and technical programs the central point, but how that math and the tendencies of the math were occurring in there. We did do the implementation. Mary Fudge, actually, was our trainer that came out. And we did that in 2009. And you can see over time the different programs that we developed, or that we had go through the program. And it was a little bit of a challenge, since we were probably I think the first group that did it just within a county. We kind of broke their mold a little bit with the number of people we had involved, but I think it worked out well.

Next slide, Jim.

Just a little bit about Arlington Public Schools. We're about 26 square miles. We're right outside Washington, D.C. You can see there that we have almost 22,000 students. We have three high schools. We have one Career Center, which the students can come to from those. We have four alternate high school programs from which the students can also come to the Career Center. We have five middle schools. And, again, it's that shared technical center which is the Arlington Career Center.

And this gives you just a little bit of an overview of our career and technical students. We graduate about 1,300 students each year, approximately that many. And last year we had 533 CTE program completers, and those are students that have gone through a series, at least two classes, in career and technical education. Over at the Career Center they would take two classes but it would be four credits worth. From that about 279 of our students had advanced diplomas, 217 had standard diplomas. And the rest had other modified diploma or else a technical diploma.

And I'm going to go ahead and turn it over to Jim for the next part of our presentation.

JE: Thanks very much. I thought what I'd do next is walk you through what is our typical approach to a Math-in-CTE session. And, of course, Mary Fudge came out and modeled this for us, and she was very helpful in helping us to adapt to some of the ideas that our participants had, some of our own curiosities, and I think we've arrived at a model that's very effective for us as a small division in which we tend to group a wider variety of CTE teachers in the same room working together as a community of practice.

So we initially gather right about the start of a typical school day, at 8:00, and we encourage people to filter in and we're very technology integrated within our Math-in-CTE program. Normally everybody has a workstation or a laptop or sometimes both. And it's just a chance for everybody to filter in and get set up at their own pace. Then we begin formally at 8:30, sometimes doing some reintroductions. We are no longer surprised by this but we were initially surprised at the number of people who just wanted to drop in and visit us and just see what's going on to learn about this model. And we would often do introductions of those visitors and encourage each of our participants to talk a little bit about their experience so far. So sometimes that half-hour window was expanded to as much as an hour.

Then at 9:00 we do something each and every time we meet, and that is reintroduce and review the process. We go through the core principles and the seven elements, and I'll talk a little bit about that in a moment. Initially that might take longer than 20 minutes, but as we progress throughout the academic year, it gets refined and most people are in agreement and could give the presentation themselves so we don't spend too much time on that as the year goes on. But we begin rather promptly with lesson development, refinements. Perhaps somebody will say, "hey, I'm eager to present this lesson." Often our participants work on them offline and using some of the tools and strategies that we'll talk about. We'll continue until just before sort of an extended period and encourage everybody to present where they are and what they're working on, even if incomplete, thereby making it a comfortable forum in which everybody can share. It's also a great time if somebody's stuck on an obstacle, you have the whole roomful of people to help you overcome it. And often those solutions come from people well outside of your curriculum area. And that, I think, has been one of the biggest rewards for our approach to Math-in-CTE.

What we do next is an unstructured block of time. We encourage teams to go to lunch together for a half-an-hour or 45 minutes but then use the rest of that unstructured block to figure out where to interrupt their work and what they need to accomplish before we reconvene at 1:00 where we really dig down and start to explore where everybody would like to be by the end of the day, what's preventing them from getting there, if anything, and what resources they may need or want. We progress again to more lesson work and refinements, and then, as we get toward the end of the day, we encourage presentations. Often during the presentations participants in the audience will make suggestions. They might say well, that really works better in step five than step four, and we use the last half-hour up to the last two hours of the day for people to make any of those last-minute adjustments, and typically one or more of us will stay there right up until 5:00 or, in a few cases, later if somebody really feels like they're making progress and they go home satisfied.

So now, because we're a smaller group, and because we represent so many areas of CTE, and because we sort of all had a natural affinity for online collaboration tools, we began using Google Apps, and our school system just this year converted to a Google Apps engine for the school division, so we were about two years ahead of the curve, but they've been very helpful to us. We provide an online repository for our lessons so our teachers can publish them and edit them as they choose. We also maintain a calendar where teachers

can indicate when and where they're going to be teaching a lesson so that others can observe or we can stop in and visit. But it also helps us with some of the reporting requirements that contribute to the research that the NRCCTE does with their pre-lesson reports that are completed by the math teacher and the post-lesson reports that are completed by the CTE teacher.

We also put these very wonderful templates the NRCCTE provided into a Google Docs template so that our participants can actually fill out the template online, in a cloud computing environment, and we can have multiple teachers working on the same lesson plan at the same time. They can also invite me, as a moderator or facilitator to jump in and help find resources, perhaps there's a formatting problem I can help them with, and Google Docs will let well over 20 people work in the same document at the same time, if that were ever desirable.

If you click on the link I provided, not now, but whenever, you'll see that I added a link to this resources page that all of our teachers know about but those of you in and outside of Virginia may enjoy. We have an entity called the CTE Resource Center in Virginia. And they maintain a system called Verso that lists all of our CTE courses, all of the competencies required for those courses, and then if you click on the hyperlink course number, you can get to a place where you can see an alignment with our core curriculum standards, so you can actually see where the math is. You can see where the science is. And you can even see where the social studies and English language arts are as well. I'm sure, folks in Oregon, Michigan and elsewhere would find some helpful links there, so I encourage any participants on this call to explore it. And if you need help, contact one of us.

Next I just wanted to touch on our calendar of professional development throughout the year. It differs just a little from what was originally recommended to us. Our teachers found that four days was just the right amount in the summer, maybe because we were a smaller group we were able to jump into some things a little bit faster. There wasn't as much introductory practice because we didn't have as many people in the room, and our teachers were able to start their curriculum mapping within just the first couple of hours, and some were eager to start building lessons within that first day. So we refined that back to four days and built extra days into the rest of the calendar year.

We also got some feedback from our teachers that it was very difficult for them to take more than one day at a time away from their classes, and because we're in such a very dense school district, I think it's, in fact, the most dense county in the country, all of our schools are within five miles of each other. So there was no difficulty for people to get here. Nobody has to stay in a hotel in order to participate in our professional development. We meet one day at a time, but we meet more frequently throughout the year.

Each and every time we meet, as I said earlier, we review those Math-in-CTE core principles. But here's something we started experimenting with last year that I think we'll probably continue forever. One of the facilitators will introduce the core principles and the seven elements in our first meeting, but then we begin recruiting teacher participants, whether math or CTE teachers, to walk us through the core principles. In doing that, we actually create teacher leaders. And it helps all of our participants when they go back to their home schools to explain what they were doing in their professional development, talk to their principals about it, and of course, help us recruit teachers for future years. We do the same thing for the seven elements.

And now, what I'd like to do is hear from Mr. Parry. I don't see Mr. Elkner on the webinar yet. If he's here I hope he'll correct me. Mr. Parry, if you're able to take hold of the audio, I'll advance the slide whenever you're finished.

J.C. Parry: I hope everybody can hear me okay. As you can see from the delightful picture of me and two of my students, I teach aviation as well as architecture and engineering and drawing here at the Career Center. And I have been a member of the Math-in-CTE curriculum committee for two years now. And I was involved in nine different lessons, for both aviation and architectural engineering drawing. I have found my coordination with Josh Folb as my lead math teacher to be very beneficial in helping to create and match the Math-in-CTE that I teach. Aviation is loaded with math, you know, whether it be the angle of attack or time/speed/distance problems or weight and balance computations that I have done, that class is just loaded with math. So most of my students who have completed at least Algebra I don't have much problem with my math, but again, I found that to elucidate the understanding a lot better ... In fact just today I taught my aviation class time/speed/distance problems lesson, and I pulled out the seven steps that I had gone through with Math-in-CTE and, you know, integrated that with the standard math problems and my students seemed to pick it up fairly well in my 75-minute block that I had with them. Some of the architectural engineering drawing problems with scale and measurements and problems I have provided in the Math-in-CTE lessons online and you can look them up through the links we've given you, and, again, I've just found it very, very beneficial. I am in the process of taking the math practice test so I can be a math teacher, too, so I think that there's a really good mix here in this curriculum opportunity for me to match both skills together with this system.

If anybody has any questions, I'll be happy to answer them or delineate more later on if you need to.

Mr. Zawolo is one of the co-teachers in my building right now and he's a math teacher, and I spend lots of time with him in the Math-in-CTE professional development working together, and we've had really good coordination between his classes and my classes as far as being in the same building. It's really beneficial.

JE: A great piece of evidence about the participants from our math group is that nearly all of them keep coming back. They get a lot out of these sessions. They clearly enjoy working with what might be considered applied math, but they certainly take a lot of examples back to their class and break up their theoretical discussions with real world examples that help students make connections that aren't explicitly, and sometimes not even implicitly, made within the math curriculum. The picture on the right features Mr. Elkner and Mr. Zawolo, who, during their first year in Math-in-CTE, decided that they would like to try to build a summer course in which students spend a whole day, I believe, between five and six hours that first year that we did this, in a summer academy in which students earned both high school and college credit in both information technology and mathematics. And they did what we all sort of dream about as teachers in working in a collaborative environment with cooperative lesson planning based on the curriculum apps that they developed together, and that model is continuing today. We've expanded that summer academy from the course they offered to include automotive technology and several others. And I'm sorry that Mr. Zawolo can't be here to tell you more.

I did want to finish with some discussion about our outcomes. I think these are quite revealing. First of all, we've had 48 participants to date. Most of our participants have at least expressed an interest and received graduate credits from Colorado State through our colleagues at NRCCTE. They get as many as 63 recertification points for their participation in

addition to their college or university graduate credits. I'm sorry, I misspoke. We've had a total of 44 participants who've published 48 lessons to date, and we're still just partway through this third year.

One thing that I do want to highlight, that Donna also highlighted earlier, is the curriculum mapping. Many of our participants note that they've never done curriculum mapping before. Some who have done curriculum mapping were quick to admit that they need to do it more often because it's a very important exercise to think, re-think, re-visit and refine what we're going to teach each and every year and take advantage of all that we learned from our previous years of experience. And in sharing that, it really enhances the community of practice.

Our last slide is just contact information, individual teachers' email addresses and a reminder of the link for these slides.

KS: Thank you so much for that presentation. We're going to move on now to our group from Oregon, and I'm going to introduce Tom Thompson, who's an Educational Specialist in Industrial and Engineering Systems with the Oregon Department of Education. Tom?

Tom Thompson: Thank you. I would like to introduce a co-presenter. She'll speak on some things a little bit later on, but my co-presenter is Kristin Gunson. She is with the Lane County Education Service District, and if you want to pick somebody that single-handedly brought Math-in-CTE to the state, I think that would be Kristin, where she first was introduced to it early on and was coordinating a pilot of the technical assistance with National Research Center in Oregon at Lane ESD, so she'll be on talking a little bit more about some of the history of what's happened. And I appreciate the conversations about what's happening in Arlington because many of the things that happened in Oregon have happened since 2006 are reflected in what's taking place in Arlington. And so our presentation today is more about the impacts of Math-in-CTE as a catalyst in the bigger picture of integration of mathematics within career and technical education and some of the things that have developed over time as a direct consequence of bringing Math-in-CTE into Oregon.

This is just a little abbreviated history of some of the things that are taking place, and have taken place in the state. And I think as we go through this, one of the key elements about Math-in-CTE that's really helped us expand and develop different approaches of integration of mathematics, improving mathematics education within career and technical education, is that community of practice that is so important. And much of what has happened statewide is not a directive from the Department of Education, but really is a groundswell of desire from the partnerships that were established within the various workshops around the state in career and technical education.

I'm going to kind of highlight the sort of sequence of events here. Math-in-CTE was supported by the State of Oregon through Perkins funds for a number of years and workshops, and then another separate issue was that I developed some guidelines for applied academics that were response to changes in our diploma requirements. So that was sort of the early work. As that developed, we ended up moving into more locally-supported Math-in-CTE workshops, and then also some of the work that came out of those workshops led into an expansion into assessment. And we ended up with what we call a small work sample project, OASIS, or Office of Assessment and Information Services, and essentially our assessment people began to see the value in CTE in terms of a source for kids to be able to demonstrate their abilities in mathematics.

Beyond that, school districts then started looking at what are some of the options for math credit within CTE courses, math credit, and actually I'll talk a little bit about some case studies that we've been doing. And then another large project, which is the National Research Center, and Donna Pearson spends a great deal of time out here in Oregon, and Mary has, too, to work on a project that sort of reverses the role of the partners in Math-in-CTE, and I'll talk about that as we progress through here.

This early work, I wanted to talk a little bit about some of the details. This particular piece, the applied academics guidelines, it really didn't have a direct connection to Math-in-CTE. It was more of a spinoff of new diploma requirements where the State Board of Education specifically said that CTE should be considered a possible connection to the academic content and specifically said that mathematics and language arts and various academic subjects, students should have opportunity to learn those within context. And so part of this early work was to develop guidelines and processes for schools to be able to integrate the CTE and mathematics within the curriculum and be able to offer students credit options. There's a link to that particular document if anybody's interested, but I think one of the things that was interesting in developing that is we really went to the fundamental literature behind Math-in-CTE to highlight the processes that teachers need to go through in order to be able to develop credit options within CTE courses or other methods of offering contextual options or applied academic options.

And if you look at that document, and I won't show it up here, but if you go out and look at it, you'll see that many of the guidelines have a one-to-one correspondence with those core principles in Math-in-CTE because actually as we were looking at what we should use as a model, Math-in-CTE came up—but everywhere that we looked in terms of applied academics, those core principles were seen in different words, would crop up over and over again.

I'm going to turn over the mic to Kristin Gunson. Kristin is going to talk a little bit about the history of what has happened specifically about Math-in-CTE in Oregon.

Kristin Gunson: Thank you, Tom.

One of the ways in Oregon that we serve our whole state, because it is a big state--if you drive from north to south it takes eight to nine hours. If you travel east to west it's about eight to nine hours. So we didn't have the luxury of being really close. We wanted a network of regional coordinators that support the career and technical education teachers and programs throughout the state, and one of the nice parts about that is we've become the ears and the eyes for our Oregon Department of Education and bring back ideas and let them know what's happening. And to just identify that we might be interested in helping support those activities.

So I was fortunate to have gone to ACTE, and right after the research had come out in 2006, and attend the workshop that Jim Stone and Donna Pearson were putting on, and I could see that this was truly a process that would work here in Oregon. So we started with setting up the technical assistance and mapping it out for the year, contacting teachers and getting it set up so that we could come together for five days in the summer. And the normal, or the regular schedule of two days in the fall, two days in the winter. A lot of our teachers, though, again, didn't want to be out two days in a row, so they chose to go and meet on a Friday and then work on a Saturday to really maximize those lessons and take them back. Great camaraderie is built between those, and as we looked at sustainability for this project, we knew that it would have to be implemented regionally. So the Department of Education started working with regions that had identified an interest in hosting these

activities, but it was open to the state. So we had teachers that would come from the eastern part of the state to the western and vice versa, depending upon where the different workshops, or different professional development, was going to be held.

From this process of opening it up and encouraging people from throughout the state, we were able to identify four to five key facilitators that could help sustain this once the Research Center was not here. So we developed this cadre, and throughout the last six years they have been contracted to go to different regions and actually put on the workshop for the teachers in that area. The beauty of this Math-in-CTE is that it's really a springboard for many other activities. By using the professional development model, it really does build those partnerships. And that's what a lot of what the teachers really value is knowing that there is somebody in their school that they can go to and talk about how they might introduce something, or is there a certain technique, or how does it work in their classroom and how does it work in the CTE classrooms.

One of the things that we have done because of the large area that we work with is we have two different regional coordinators, people in my position only in different parts of the state, who have developed a Web site that will not only house the lessons for people to take a look at, but also then talk about the project and how it benefits. One is from the Clackamas area, which is up around Portland, and one is from central Oregon in the Bend area. And these are updated with the lessons that teachers have done. A lot of times we don't always have a full eight to nine teams in one content area. And so to enhance what the teachers are doing, they can go and take a look at the Web sites, identify the lessons, see how they might use those lessons, and also then use that and build on that so that there's more lessons all the time. It makes it a nice way to help teachers really have that broad component of several lessons that they can refer back to.

TT: Thank you, Kristin.

One of the things that I wanted to point out, too, in respect to these regional approach that we've had. You saw on the previous slide we've had up to or well over 15 regional workshops. It's hard to keep track any more because they keep popping up in places. But to lead into some of the expansions that are going on as a result of Math-in-CTE, you'll notice, it's just barely visible on the slide, but there's a thing that says Advanced Math-in-CTE in the capture of one of the Web pages. And actually the central Oregon region has been working to come up with the next level of Math-in-CTE for teachers who have already been through once and have found it so powerful that they want to come back and do more. I don't have details on that, but they're working on what that would look like.

There are a number of things that are direct spinoffs of Math-in-CTE, and I'll just mention the one that's coming out of the central Oregon region, or High Desert ESD. The reason I want to bring them up is they're not Math-in-CTE in themselves, but they are the result of those communities of practice coming together, the math teachers, the CTE teachers, working on something extremely powerful and realizing that it could be stretched to something even better and even bigger for their particular settings.

A number of school districts around the state, and this is not a complete list, this is just a partial list of school districts around the state, and schools around the state have leveraged that community of practice and really developed options for offering credit for Math-in-CTE. That has never been the emphasis of the workshops in themselves, but these teachers have—the math teachers realized that the math is solid within these lessons that are being developed. They know the CTE teachers. They know the CTE teachers teach this. They work together as a team. And in the school districts that I've highlighted here, Salem-Keizer,

North Marion High School in the North Marion School District, Mountain View High School in the Bend-La Pine School District and the Beaverton School District. Teachers within those districts essentially stepped forward and said we need to do something, we need to offer something more for students because we think this is an incredibly powerful approach. So they're using Math-in-CTE, they're using the lesson development, the seven elements for lesson development, they're using what they learned in Math-in-CTE in developing robust mathematics embedded in career technical education courses that kids could take and receive credit, not only in career technical education but also in mathematics to lead towards the requirements for a diploma.

Salem-Keizer School District actually developed a process for identifying how much math needs to be in a particular course to be able to receive credit. We have several options in Oregon. We have another option besides the Carnegie unit of 130 seat hours. We also have a proficiency option, and school districts can decide that there may be different ways of identifying credits and how to receive a credit. And the Salem-Keizer School District has done that. In addition, anybody that offers this CTE course that has math credit has to also participate in math professional development, so the math teachers are now being joined by CTE teachers in the professional development within the district and outside of the district.

North Marion High School developed actually two courses now in engineering math, and those are developed by a CTE teacher, the engineering teacher and a math teacher. And the math teacher spends a lot of time with the CTE teacher assuring that the level of mathematics is robust, that it's explicit within the development, and they've found it to be very successful in working with students who need another option for mathematics credit, and they have some data that indicates that the students have really benefitted from this option.

Then in Mountain View High School, this is an extremely complex partnership, I would say, between an automotive teacher and a math teacher where they have numerous options ranging from math credit available in automotive courses to parallel side-by-side teaching mathematics and Algebra I, of course the math teacher is teaching Algebra I while the CTE teacher also reinforces the Algebra I within their automotive class because they have many of the same students. And now recently they're working on putting science into the automotive courses. So they've got a very strong connection and within that district, within the school, and in fact the CTE teacher has been invited to present at math conferences about the work that's been going on.

Beaverton School District, a large school district in Oregon, has been working on ways to be able to embed mathematics credit within CTE, and they've focused heavily on Project Lead the Way as a content area.

We're following up with some case studies, although they're not published yet, we're working on pulling all of that together, it's in process, on the school districts to identify what were the key features that helped them develop this. One of the key features is that partnership. As we talked with these individual schools and the teachers involved realize that that partnership, that community of practice, was extremely powerful.

One other focus that we're working on is kind of a spinoff of what the National Research Center has identified as something that the math teachers show a great deal of interest in—the mathematics that's being taught in career and technical education. And oftentimes we found this to be the case, and I'm sure it's happened in many other places, is the math teachers will take those lessons and incorporate them into their own teaching in mathematics. And we began to ask the question, well, what if we were to turn the tables

and say what if the math teachers could develop a curriculum around mathematics that is contextualized with career and technical education and the math teacher was the teacher, but the CT teacher was the consultant, the person who assured that the context was real, authentic context. And so what came out of this is a research and development project. We're now working, finishing up year two of that project. We have one more year. The National Research Center's helping us with that, and the cadre of teachers developed a course they're conducting within their schools, and part of the results of this is to identify a process that other schools could use, and other teachers can use, to be able to develop similar kinds of courses to enhance mathematics and give students opportunities to learn mathematics in other settings.

A little piece that was kind of interesting that leads into something that may be growing quite big at this point is the connection to statewide assessment. In Oregon we have OAKS, which is our statewide tests, and there's an OAKS for mathematics, and that is part of the AYP reporting. It is also becoming part of the graduation requirements for competency in mathematics. One option is to pass OAKS. Another option if you don't pass the OAKS test is that you can actually do work samples, and the state of Oregon has developed a statewide math scoring guide, and guidelines for developing these work samples. At one point the Office of Assessment and Information Systems came to me and asked whether there would be a possibility to draw out some work samples with a CTE context. So we pulled together some teams of Math-in-CTE partners from Math-in-CTE workshops. They met as a group several times and were able to develop some examples of work samples that students can then use to be able to meet the graduation requirements and show their proficiency in mathematics.

So what it has done is it has provided a nice additional piece that CTE can contribute to the general school culture and the general diploma requirements by providing an opportunity for students to be able to demonstrate their ability in mathematics within a CTE context which may be more meaningful to them than the OAKS test.

The link there that Catherine has also posted in the chat goes to the specific page for some examples. Schools can develop their own samples. These are just examples of what something might look like, and there should be student work also attached to those.

These spinoffs from Math-in-CTE fit within a sort of a theory of action the Department of Education has used to govern, or to guide some of our work statewide. This is based upon Richard Elmore's work on Instructional Core coming out of Harvard, and a statement within that Instructional Core is that increases of student learning only occur by improvements in the level of content, the teacher knowledge and skills, and student engagement. And so really what we started looking at is how this Math-in-CTE and all of these spinoffs, how do they really support this theory of action in terms of improving instruction, improving student learning, increasing student learning. And we, as we looked at it, we realized that the professional development that we were providing through Math-in-CTE and the regions were provided, and now as we move into literacy and CTE and also the applied academic project, really helped enhance what the teachers practice, and both math teachers and CTE teachers. Students then benefitted and can become more engaged through context-based lessons in math, in literacy, and then the course that we've been developing through the applied academic R&D.

Then the question is how do we raise the level of content overall? And some of you that have been involved in Math-in-CTE recognize that some of the lessons in Math-in-CTE are very important and critical content for math, for CTE and also for understanding in mathematics but aren't always at a level that matches with the Common Core. In many

cases they are. We've seen a very robust level of mathematics in that. And so one of the things we started looking at and we're just beginning to approach is to, at a state level, is to look at how we can improve the content using what we know about Math-in-CTE. One of the things that we noticed was that Math-in-CTE lessons, and the structure that comes in in the seven elements, looks very much like the problem-solving pieces that are emerging out of the Smarter Balanced Assessment Consortium work that Oregon is involved with that's tied to the Common Core state standards.

With that in mind, we then started looking at what that means in terms of promoting a more rigorous curriculum, more rigorous content in mathematics and literacy, and we decided that we're starting to focus on how do we take what we learned in Math-in-CTE, leverage the work in Math-in-CTE, meet district and state needs. Districts have expressed a concern that students don't have enough experience with problem solving in mathematics and one of the things that we see is that the Math-in-CTE lessons that are developed are heavy in problem solving. And then we also want to see a line with Smarter Balanced Consortium to be able to help students understand what they're going to need to be able to do, and that combined with a grant that our community college partners have that's a private grant, we're going to start embarking on a project. We've been working with the National Research Center to do some background work with us to try to figure out where this would go, to look at how can we provide the problem-solving tasks that are embedded in Math-in-CTE and be able to really use those as a means of leveraging assessment in Math-in-CTE to be able to improve students' abilities in problem solving and raise the rigor of mathematics within the career technical education programs, and in mathematics in general.

So this is kind of our most recent project. It is just on the beginning stages, but we look forward to really moving forward on that and kind of fill in that triangle of the instructional core that we use as sort of our guide.

I pretty much have summarized the main pieces to this, so I'm going to pass the ball back.

KS: Thanks, Tom. This is Kirsten at the Center. We are ready for question time. We've had quite a few come in, both before the presentation itself for those who couldn't participate in real time, and also via the chat panel and to me privately. So I'm going to start out with a question now. Tom addressed this for Oregon, but I'm going to throw this to our Arlington group and also to Mary. So for our Arlington group, can you talk about are you able to offer math-enhanced CTE classes for math credit, and for Mary, can you talk about how other states and districts are handling the credit issue?

JE: This is Jim in Arlington. I'd like to encourage Kris to answer this because he plays that direct role with our colleagues at Northern Virginia Community College where we explore these very things.

KM: Yes, in Arlington, and in Virginia, we haven't been able to give math credit. We've had a couple of classes like J.C.'s aviation class where we have gone through the process of sending all of the documentation down to the state for them to review it, and they felt that even though it was heavy in the math content, it did not equate to giving a math credit, so we haven't been successful in doing that. We have been successful in a couple of our programs getting a science credit, but we haven't been able to get a math credit at this point.

MF: This is Mary. In several states that I've worked in, one of the requirements for graduation in math is a fourth year of math that isn't specific to any particular math,

whether algebra, geometry, or whatever. It just has to be a fourth year of mathematics. Many of the sites are able to use their curriculum math to identify that they're teaching enough math in their course, in their CTE course, that they're allowed to give that fourth year of math credit to the students.

KS: Thank you, Mary. Another question has come in about co-teaching with CTE and math teachers, you know, in the same classroom, using the Math-in-CTE model. Now one of the videos in our series features a wonderful IT lesson presented by Mr. Elkner and Zawolo at Arlington, but it's not necessarily a common thing for teachers to teach together in Math-in-CTE. So for our whole panel, are there times when it would make sense for both teachers to be in the classroom, and what can you say about that?

DP: Kirsten, this is Donna, and I think I'll start out by just giving a little bit of background. When we began to design and initiate the research study, it wasn't feasible to use CTE and math teachers and co-teaching. We couldn't get enough numbers, and co-teaching in schools does add expense. So we don't see a lot of co-teaching going on. If it's happening, it's often in a technical center, and I'm going to have Mary address this. But there's nothing prohibiting anybody who's implementing Math-in-CTE for allowing co-teaching. It's just that in our study it wasn't feasible for us to use teaching teams, so we tested a model that we knew could potentially be successful for CTE teachers who were teaching alone. And so our results are based on that. There's one caveat, and before I throw this over to Mary, that what we have found out is that there's a lot of fear in our young people when it comes to mathematics. And unless they're maybe familiar with their co-teachers and used to having them teach and co-teach, they can become very intimidated. Learning the mathematics in CTE, in their CTE classes, is less intimidating. Mary?

MF: Many times in the career tech ed centers there is a math teacher on staff who can go in an co-teach or assist during those lessons. And it is very beneficial for the students to see a math teacher along with the CTE teacher teaching the lesson. Unfortunately it's cost prohibitive in most cases, so I think that's why we don't see a lot of it. But it can be very beneficial.

DP: In the case of Arlington, we see a wonderful example, and I think of how co-teaching really works well with this. And we don't have Mr. Zawolo or our other, Jeff, on board, but Jim or Kris, would you comment?

JE: Gladly. Of course the biggest challenge for teaching, or co-teaching Math-in-CTE, or really combining any two subjects into a co-teaching environment, is scheduling. It's particularly challenging for math because there's really no grade-based cohort that will predictably be taking the same math courses in the same way that they might be taking the same science course, social studies course, English language arts course, that could be fit with a CTE teacher to do complementary studies. In that case that we shared with Mr. Elkner and Mr. Zawolo, they actually did have a cohort of shared students that year that they could experiment with and try this, and they both enjoyed it very much. The students enjoyed it very much. And they did quite well. We're experimenting with this next year during the academic day where we've petitioned our school district leaders to consider what would be a half-day pilot project where students take a CTE course—these are all high school juniors—they take a CTE course, the same math course, the same science course, or perhaps choose between two, and the same English 11 course. And that gives us this opportunity for lots of collaboration between the teachers of these shared students.

And it would be interesting to be able to do more of that, and we're hoping that, you know, with this pilot we're going to be able to see how that will work and see the benefits that we

can have from that. But, I think, like was stated before, it is a little bit difficult with bussing our students over and then bussing them back. With the half-day program, it will allow us a little bit more time to be able to work collaboratively with those different subject areas and with the CTE class, and I think it's going to be very beneficial. But I also think, you know, it is difficult in some places to be able to do that and also for the funding of that and to have enough students for the number of teachers that you would have as well.

TT: This is Tom from Oregon, and I'm not going to say anything new that you haven't heard. We're primarily a comprehensive high school state and as far as CTE is concerned, we actually have one official technical center in the entire state. And even in that setting where you've got the math teachers and the CTE teachers in the school all day, it's not practical for them to do the co-teaching. But anecdotally what we find we get from teachers is that the math teachers and the CTE teachers having communicated with one another, actually the students see that, and so that connection, they make the connection and the CTE teacher can talk about the math, the language that they're going to be seeing in the math course. They know the math teacher by name. They know what they do. And there's a lot of that—the benefit of co-teaching that comes out just because of the strength of the partnership.

KS: Thank you all. I have a couple of questions related to recruiting. One of these came in before the webinar and another one was submitted during the chat itself, and that is how do you go about choosing which teachers to participate or encouraging teachers to get on board? Particularly, how did you invite math teachers to the table. One of our questioners says that she's found it difficult to get folks out of their content area silos. And then I would put to J.C. in particular as a teacher, what motivated you to want to participate in the model?

JP: Well, this is Mr. Parry, J.C. Parry. I was coerced into going by Kris and Jim because they felt that I—with my engineering background—that I was already going to be strong in math, and then my engineering classes as well as my aviation classes lend themselves so well to math that it would be a natural fit. So I got shanghaied into it, and, again, I've loved every minute of it, and, you know, we'll be trying to do it again next year, perhaps as a math teacher. It is tough to get—we've been blessed here in the County with some great math teachers who really want to do it. Besides Mr. Zawolo, my cohort is—or my partner in crime is Josh Folb, and he's been with the group for three years, and he and I just have really hit it off. In fact, in preparation for the practice test, I have been actually going to him on Sundays and getting tutored in math so I can try and pass this test, so, you know, working with him, he has motivated me to become more energetic in the math area and so I can be a cross-representative.

KM: This is Kris Martini. One of the things that I'll say that was helpful was when we first started looking at the program, I talked to our math supervisor and talked to her about the program, and she was very interested in the program, and interested enough to send the math specialists, or math specialist. So I think early on, you know, we had support of the math department in our district. And that was very helpful. And they promoted it to their teachers at county-wide meetings and at other meetings, and then the other thing that we looked at, too, is with our CTE teachers, we asked them to go out and, you know, make contact with their math teachers. And most of them already had contacted them before, and that's how we kind of got our math teachers in was from our CTE teachers talking to them, and also from the support of the math department. So I think it was kind of a twofold process.

JE: I was going to say something very similar. What I thought was charisma is apparently coercion, but if it works, it works. But I think that key thing is to encourage your CTE teachers to identify colleagues that they already work well with, or have a rapport with, that they then might recruit or at least identify so that we could then recruit. Kris and I did visit the math teachers' county-wide meetings at the beginning of the year, and that resulted in some recruits. We're often pleased to discover that once the math teacher does investigate what we do, they are much more interested than they might have been before they met us. That tells us that there are probably some things we can do in terms of promoting or describing the program.

TT: And this is Tom. Kristin could probably say what's happened in her region, but generally in Oregon one of the state math specialists is on board with what we're doing, so we communicate rather frequently. We do present at math meetings to kind of talk about what Math-in-CTE is, but basically it comes down to the CTE teacher having to make that contact. And most of the instances where a math teacher has sort of been pushed into the relationship, you know, haven't worked very well. It needs to be mutually accepted, even if it's a little bit reluctant in the beginning, if there's an agreement that they're going to try it out, and we really stick to that.

KG: This is Kristin. One of the things that we've tried to do is to make the professional development fun. There are some sites that use a theme. We try to make sure that they're comfortable, so that when they go back and talk with their other teachers, they really have a positive feeling about the kind of professional development.

KS: Thank you all. Here's a related question. How do you get the support of administrators who don't have a CTE background to be able to coordinate all of these training efforts?

TT: You know, in Oregon, the approach is really about the teacher. It doesn't require a systemic change. We use Perkins funds to help pay for the professional development and we've used the state funds when we were running workshops at the state level. And so it doesn't require a huge investment of the school or the administrator other than they just need to release the teacher for some days that, you know, and get a substitute, and even that is oftentimes covered. But they tend to buy in over time as they realize what's happening and realistically many of the administrators are starting to look closely at alternatives for students that are struggling in mathematics. Not that this is necessarily geared toward just students who struggle in mathematics, but that's their perspective. And they look at this as a means of helping students who are not doing well in more traditional instruction in mathematics and so they see it as a positive. I don't know if I've heard of any situations where an administrator has just completely dismissed the idea of having teachers involved. In fact, we have many administrators that have, after one team has gone, they have asked for us to send other teams to the workshops.

KM: I would concur. This is Kris Martini in Arlington. I would concur with that. We've had very positive results from our administrators with the training. Actually I had one administrator come up to a meeting to me and said, "I saw my tech ed teacher working with our HILT, which is our English as a second language teacher in mathematics doing a lesson, and they were using the micrometer and he was showing how the micrometer worked and how you would put the decimal point in, and the decimal point to the right and to the left of the decimal point and how that all worked," and she said that was the best lesson I've ever seen and these kids were really walking away and really understanding, you know, the principle that they were doing. And this was kind of an offshoot because the math teacher was the one, actually, that had been in the Math-in-CTE, and she actually went and got one of the CTE teachers in her building, which hadn't been part of the program, and had them

working together, with their students working together, and once we had that it was the best advertising we could ever do. But I would concur that, you know, once the principals start seeing what's going on and how it's working, they're on board with the training.

JE: And just one thing to add to that in the same vein. If we can invite more people to just drop in, even unannounced, they'll actually see it in action. If they're lucky and we're lucky they actually get to see a lesson being described and see the teacher getting feedback from his or her peers, and nothing demonstrates the power and capacity of this professional development program like that very process. They see the community in practice, they see the teacher investing in their planning, they see the integrated math, and it sort of becomes quite self-apparent and. We've had our superintendent intend to drop in for 15 minutes and stay for close to 90 minutes and actually engage the teachers with questions and participate in some of the strategies and lessons the teacher was describing.

KS: Thank you, Jim. Here's another question that I'm going to throw out to the whole panel, and that is what type of help do you offer to students who require some kind of remediation or additional basic math support?

JP: This is J.C. Parry. I'm fortunate, I have a 75-minute class every day of the week, and as a result I can teach my lesson usually in about 50 to 60 minutes before the students start to get a little rambunctious. And I have found that I use that last 15, 20, 25 minutes to work with those students who are having difficulty understanding the concepts, and especially who need a little extra help understanding the math principles. And in fact some of them even come by after school to bump up their math, so I spend the extra time with them to do that. That's all I have.

TT: This is Tom. One of the things that I've emphasized when I've been involved in the Math-in-CTE workshops is that although we talked a lot about credit, it's not the main focus. Math-in-CTE is about improving students' understanding of mathematics, and if that means that they need to understand a level of mathematics that is considered remedial at a high school level, then that's great and the math teachers have actually chimed in. There was one session I was at where that question came up, and the math teachers pointed out that we need all the help we can get to work with kids that are having trouble with the mathematics that we're trying to teach. If you can spend time working with them on concepts that they haven't gotten yet and they should have had by this time, then that is the more power to it. That's an important thing. And that's really, I think, one thing that some of the teachers seem to forget is that it's important to understand that the mathematics is not all about earning high school credit, it's about being able to be better at mathematics and you start where you start.

MF: Kirsten, this is Mary Fudge. In our seven elements, element two assesses the students' awareness and where their level is at of the math that you're going to teach in the lesson. And many times we find as we're working in that lesson, that maybe they don't have all of the background they need, so sometimes the teacher has to stop and kind of do some review and bring them up to speed a little bit so that they do have the math that they need. So that element two really serves to do that review and to help bring those students up to speed to do what's needed in that lesson.

KS: Thank you, Mary. Related to this issue, and something we haven't talked in great depth about, how are your students responding to these math-enhanced lessons, and what have been the greatest benefits to students to participating?

MF: I'll go ahead. The feedback that I get from the many sites that I work at, when the teachers come back in the fall and again in the winter, they tell me that their students love these lessons and that they're very successful with them and that they're very eager to go forward and to do more of them. I have all positive results coming back on that.

We have positive results also from our automotive teachers. As they were going through the process, you know, they were not reluctant to do it but they were kind of wondering how the response would be from their students. And it was kind of amazing, I'd get calls from the teachers after they've done some of the lessons, and said, you know, my students really appreciated that and they really had a good understanding of it and they were kind of relating it to some of the activities that they were doing in their math classes. So I thought that was very beneficial, and I thought that was some good comments coming from the teachers, and I think the teachers appreciated that as well. I think that just reaffirmed the importance of what we were doing.

I think many of our participating teachers also let go of many of the assumptions and presumptions that you hear from many other teachers who tend to get frustrated about the level of math, or the level of reading skills that students bring to their classrooms, and instead see it as an opportunity to reinvest in that student, or to build a bridge between something they may have memorized briefly some time ago and actually create an understanding now that they have this context in which it can be taught in a way that the student will retain.

TT: And this is Tom, just briefly, I'd like to echo what has been said. I don't get out to the schools to see what happens within the classrooms, but I do hear from teachers and get the same kind of responses that Mary talked about. I think teachers are apprehensive at first. Some of them describe that the kids are a little apprehensive at first because they didn't take that CTE class to learn some math, but that seems to die off pretty quickly. And it seems to fit right together.

KS: Thank you, Tom. This is Kirsten again at the Center. We're just at time. Donna and Mary, is there anything you would like to add or say in summation, or are we good to go?

DP: I am just so thrilled that we have had our site leaders and teachers be able to join us today. I think they've done a wonderful job of telling this story, and I have nothing more to add. Only that, Kirsten, we have some questions that we still need to respond to, and the process that you want us to use in responding.

KS: Jennifer Sawyer and I are answering some questions privately to folks who have asked them. And any that remain unanswered, we will write out some written responses and include those on our Web site when we post the archive webinar and the PowerPoint slides.

JE: Thanks for the opportunity to share.

CI: Yes, thanks, everyone, for being here. Thank you all for attending. As we mentioned, the slides and further information about today and the recorded webinar will be available at the National Research Center's Web site, which you can see displayed. So thank you all for joining us.

Thank you.