



RESEARCH for *ACTION*

**LESSONS FROM INSIDE THE CLASSROOM:  
Teachers' Perspectives on the MDC Initiative**

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January • 2013



## Special thank you to practitioners

This research would not have been possible without the participation of teachers and other educators, who shared their experiences in the Math Design Collaborative (MDC) initiative with Research for Action (RFA) staff.

The following school districts and networks of schools participated in this research: Jefferson County Public Schools (KY), Kenton County School District (KY), New York City Department of Education (NY), and National Council of La Raza. Teachers generously opened their classrooms and gave of their planning periods, lunch breaks, and after-school time to share their experiences with RFA staff.

RFA would like to thank all educators who participated in this study. We hope that you find some value in this booklet, which was produced with you in mind.

To find all of RFA's reports on MDC, go to [www.researchforaction.org/rfa-study-of-tools-aligned-ccss/](http://www.researchforaction.org/rfa-study-of-tools-aligned-ccss/).





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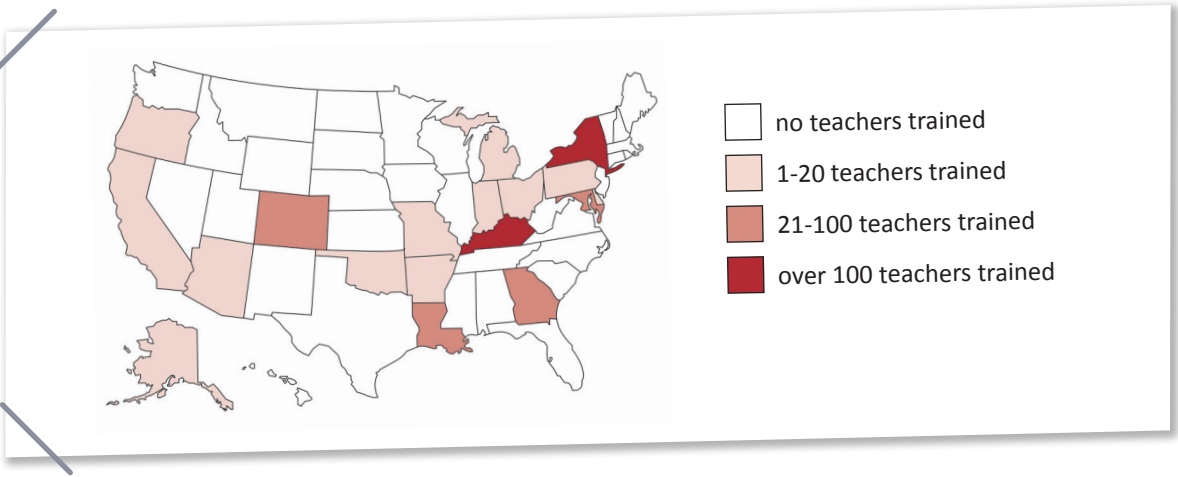
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# Introduction

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The Bill and Melinda Gates Foundation has invested in the development and dissemination of instructional tools to support teachers' incorporation of the Common Core State Standards (CCSS) into their classroom instruction. Math experts from the Shell Centre have developed CCSS-aligned formative assessment lessons that teachers can incorporate within their existing mathematics curricula.

For the past two years, Research for Action (RFA) has studied teachers' adoption of these formative assessment lessons (Lessons), concentrating on teachers' responses to and use of the Lessons, and their expansion and scale-up in the 2011-12 school year. The Lessons are currently being used in urban, rural, and suburban school districts, as well as in several national networks of schools. The figure below displays the states in which teachers have been trained in MDC tools over the past two years, and provides an indication of the approximate number of teachers receiving professional development in each state.



During the 2011-12 school year, RFA conducted fieldwork and administered surveys in four sites and the resulting data informed this teacher booklet. RFA staff interviewed 53 teachers and conducted 20 observations of teachers using the Lessons. Ninety-six teachers also completed an online survey.

## How to read this booklet

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Building on *A View From the Inside*,<sup>1</sup> which explored Year One of MDC, this updated booklet shares teacher perspectives on the second year of the MDC initiative. It synthesizes teachers' reports of the experiences using the Lessons in their classrooms, the supports they received from their administrators and peers, and their impressions about the impact of the initiative on their overall instructional practices and student learning. Throughout the initiative, teacher perceptions and feedback have helped tool developers, professional development providers, and district and school leaders to continue to refine and improve MDC.

We hope that *Lessons from Inside the Classroom* continues to inform and prepare teachers and school leaders as they begin or expand their use of the Lessons, and that it reveals new insights, raises questions, and promotes discussions within your schools and departments.

## A word about terminology

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In this booklet, we use many terms that are specific to the CCSS-aligned math tools.

- The **Formative Assessment Lessons (Lessons)**, the specific math lessons or tools that have been developed by the Shell Centre, are a central component of the MDC initiative. The Foundation has begun referring to the Lessons as Classroom Challenges. While we continue to use the term Lesson(s) throughout the booklet, we acknowledge that the use of this term is evolving with the expansion of the initiative.
- **MDC** refers to the broader initiative, which includes professional development to help teachers and other educators use the Lessons and formative assessment strategies on a daily basis.
- In this booklet, the terms **“first-year”** and **“experienced”** tool users refer to the length of time teachers have been involved in the MDC initiative. **“Experienced”** tool users began using the Lessons in 2010-11 and some may have also participated in “readying” professional development, which focused on formative assessment strategies. **“First-year”** tool users began participating in the MDC initiative during the 2011-12 school year.

<sup>1</sup>*A View from the Inside: Teachers' Perceptions and Use of the MDC Framework. October, 2011.*

## What did teachers say about their work with MDC in Year Two?

### Teachers were enthusiastic about using the Lessons.

Eighty-nine percent of teachers reported that they would like to **receive** more Lessons next year and 99% of teachers said that they **plan to make improvements** to how they use the Lessons next school year. On average, teachers reported that they would like to use six Lessons during the school year.

### Teachers' beliefs about teaching mathematics

**were highly aligned with the MDC initiative.** A core component of the MDC initiative is facilitating student learning rather than providing direction instruction. To use the Lessons effectively, mathematics teachers are required to teach in fundamentally different ways than most teachers traditionally teach. At least 95% of all teachers surveyed reported that:

- Asking students guiding questions was an effective instructional strategy.
- Taking on the role of “facilitator” or “coach” was an effective instructional approach.
- Providing class time for students to persevere through difficult math problems is an effective method for strengthening students’ mathematical understanding.
- Peer-to-peer problem-solving is an effective way to strengthen students’ mathematical understanding.

In the quote below, a teacher describes how the “teacher as facilitator” model promotes peer-to-peer learning:

*Even with our traditional teaching, there are still not enough opportunities for me to meet everyone's needs and be there for everyone every step along the way. But, with the Lessons, they're [students are] able to lean on their peers, so that they can get a lot more interaction and help from them, because I can't be there every step of the way, nor should I.*

— high school math teacher

*It's [MDC initiative] changed my thinking unequivocally. I've gone from doing the traditional 'stand-in-front-of-the-room' model, to 'you students do the problem,' to doing station work and exploratory activities at all levels.*

— high school math teacher



**When using the Lessons, teachers understood and embraced their new role as instructional “facilitator” or “coach,” rather than providing direct-instruction.**

In interviews, both experienced and first-year tool users across all sites reported having a common understanding of their new roles as facilitators and coaches during the Lesson, which is a promising sign that they know how to use the tools and implement the CCSS of mathematical practice. In the quotes below, teachers reveal how their instructional practices have shifted:

*I've been teaching for 36 years, and teaching the same way. It's hard to change; to teach an old dog new tricks. But now that I'm doing it, I love it....At first, I felt like, 'God, I'm not teaching!' But now I realize that they really are learning, and doing more on their own. I don't have to stand up there and teach my heart out, and they [are] still not getting it. But now that they're doing most of the work, they're probably learning more.*

— high school math teacher



*I'm more of a facilitator now. I've had to work more on the questioning, and I think the professional development helps with that, to come up with feedback questions, to guide them rather than give them the direct answer. I guess that's how my teaching has changed. I'm better with my questioning; I'm more purposeful with my questioning. I'll stop and ask myself, 'How do I want to ask this?'*

— high school math teacher



## **What were some key differences between the experiences of teachers new to MDC and those with MDC experience in Year Two of the initiative?**

In general, first-year and experienced tool users reported positively about using the MDC Lessons in Year Two. **However, our research found that teachers who had more experience using Lessons also had more knowledge about how to use Lessons in the classroom and were more positive about using the tools.** By highlighting these differences, we hope to illustrate for teachers and school leaders using MDC tools for the first time how knowledge and perceptions about using the tools can evolve with experience. We also hope that highlighting these findings will help mitigate some of the apprehension that can accompany teachers' first-time use of the tools.

We [math colleagues] all felt that there was value in it. There was no argument or discussion; we all agreed that we needed a different approach. It has been refreshing for us to find out what a Lesson has to offer to us as teachers. We have to have the open mind that we have to change as teachers if we want to really make this successful. The change makes sense to us and we were ready to change.

— high school math teacher  
(experienced tool user)

**Teachers with MDC experience valued their participation more than teachers new to the initiative.**

An overwhelming majority of experienced tool users (94%) agreed that it was worth the time and effort involved, compared to 79% of first-year tool users. After participating in the initiative for a year or more, and experiencing some of the teaching and learning benefits, experienced tool users often perceived greater benefits to their participation than did first-year tool users, who had less time to use and reflect on the tools.

**Experienced tool users had a greater sense of ownership of the Lessons than first-year tool users.**

Experienced tool users (84%) were much more likely to consider the Lessons an important part of their instructional practice than were first-year tool users (56%). Additionally, more experienced tool users (96%) than first-year tool users (81%) reported that they looked forward to using the Lessons next school year. Our findings suggest that teachers with more experience with the tools also reported using formative assessment strategies even when they were not using the tools. That is, teachers with more experience using the Lessons were more apt to implement formative assessment techniques in their daily practices.

**Experienced tool users were more likely to see a link between the Lessons and postsecondary success.**

Ninety-four percent of experienced tool users, compared with 84% of first-year tool users, reported that the Lessons could help students become better prepared for the postsecondary arena.



## What did teachers say about using the Lessons in the classroom in Year Two?

★ Each Lesson consists of four substantial and interdependent activities:

1 a pre-assessment

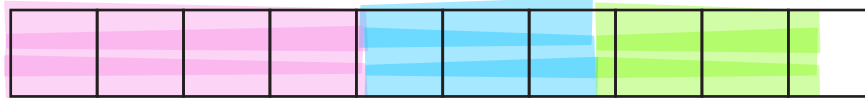
2 a collaborative activity

3 whole class discussion

4 a post-assessment

*Each Lesson may vary slightly.*

**Teachers had access to more Lessons in Year Two than in Year One.** In Year One, many teachers relied on their District Leaders or professional development sessions to obtain new Lessons. In Year Two, Lessons were stored in centralized locations, which made access much easier. Teachers are accessing the Lessons in the following ways:



Shell Centre website

42%

Their district or network

27%

Email or use hard copies

26%

**Teachers felt that Lessons provided them with effective strategies for teaching their content.** Eighty percent of teachers reported that their use of Lessons was an effective way to teach content. They also said that Lessons helped to reinforce previously taught content (97%), deepen students' mathematical knowledge (87%), and prepare students for summative assessments (77%).

*You get these 'Aha's!' everywhere. At the end, when making the connection between the table the graph, and the systems, I think that kind of closed some of those knowledge gaps for students.*  
— high school math teacher

## Most teachers reported that using the Lessons helped them reach students with different mathematical needs.

Teachers said that the Lessons helped them differentiate instruction for their advanced students (92%), students who struggle with math (87%), students classified as special education (79%), and ELL students (70%). Additionally, 81% of teachers reported that the Lessons' pre-assessments helped reveal their students' mathematical strengths and weaknesses.

*I noticed yesterday that I have a special needs student who was turning around and helping another group. For him to reason and feel comfortable doing that was light years ahead. He was helping with a story about the skateboard and how it's gradual and continues to be gradual. The other graphs have a stopping point. He kept saying 'the skateboard graph looks like a hill.' He changed his language to saying that when it 'curves,' it's 'gradual.' That shows it [the Lesson] is changing his thinking.*



— high school math teacher (experienced tool user)

*I think the Lessons are designed for students to share and gain knowledge together. I had very little difficulty, and I was anticipating major issues with my ELL students but I had very little issues due to their working in groups and pairs.*

— high school math teacher (experienced tool user)

## Some teachers modified the Lessons to better “fit” students' needs.

Examples of strategies and modifications include:

- extending or shortening times,
- strategic grouping of students,
- rephrasing questions,
- discussing terms and vocabulary, and
- reading instructions to students.

In making these modifications, some teachers are figuring out how to differentiate on their own:

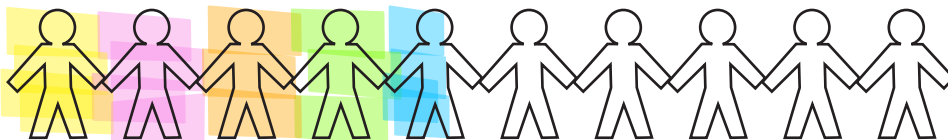


*Sometimes the questions [in the Lesson] are just abstract enough to go over their heads. We have a large population of special education kids and they're very concrete thinkers. I'll add something that helps them click, it gives them a hook, a visual, something they're familiar with.*

— high school math teacher

**Teachers had a strong sense of how to group students for collaborative work.** The collaborative activity is a central component of Lessons, requiring students to work together in pairs or small groups to complete this portion of the Lesson. Teachers tended to group students purposefully, instead of letting students pick their partners.

## 46% reported grouping students heterogeneously



**Heterogeneous grouping enabled higher and lower level students to learn from each other.**

*[Heterogeneous grouping] worked well because what I found was that the higher level students embraced the opportunity to lead other students. ...That was directly helpful to the lower students at the table.*

— high school math teacher

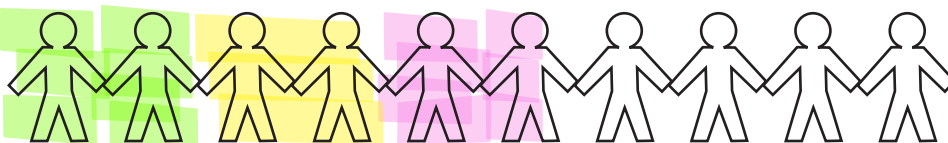
## 28% said they were grouping their students homogeneously



**Homogeneous groups allowed teachers to work with students more efficiently, help them struggle together to find a solution, or allow higher level students to move on.** *I do have them grouped a lot of the weaker math students together, the stronger ones together, that way I could kind of just focus in on those groups, and a lot of them it was trying to make them pull out their book and look up, what is that formula? And trying to remember everything. The brighter math students will just get it, the weaker ones, it's like, let's find it, let's see where it is, what do you know? And it's much more questioning on it. So a lot of prior content knowledge had to be activated.*

— high school math teacher

## 57% preferred pairing students for collaborative activities over groups of three or four.



**Working in pairs allowed students to more equally distribute the work.** *I'm also not going to have them bigger than about three people. I prefer to keep it at two, actually, because that would improve accountability ... I haven't quite made a final decision on two or three students, but I'm leaning toward the two, just so that nobody can sit on the side without having to say or do something with this.*

— high school math teacher

## Teachers felt that the alignment of Lessons with curriculum and pacing guides improved in Year Two.

A strong majority (81%) of teachers reported that the Lessons were aligned with their curriculum. In one site, a district leader and group of teachers collaborated to align the Lessons to their curriculum. In two other sites, teachers decided collaboratively which Lessons they wanted to use. These Lesson-selection strategies led to increased alignment between the Lessons and the curriculum.



*We've been talking about interior angles, exterior angles, in any polygon, and how those worked out. This Lesson fits seamlessly with that [curriculum], so it gave them a chance to use what they know, and some of them remembered it really well, some of them didn't, but you get a chance for them to actually show what they knew. And then improve on that a little bit more in the next couple of days.*

— high school math teacher (experienced tool user)

## WHAT TO WATCH FOR

### While teachers found ways to differentiate Lesson instruction, many also indicated they would welcome additional support to provide effective differentiated Lesson instruction.

A significant minority of teachers wanted more help with differentiating Lesson instruction for ELL students (30%) and students classified as needing special education. They also expressed concerns about how much they can adapt the Lessons to meet the needs of their students without diluting the mathematical richness of the Lessons. The tension between implementation fidelity and making the Lessons both accessible and meaningful to diverse students is reflected in the following quotes:

*I think my ELL students have difficulty. I find that there is often a connection students can't make and it frustrates them and they'll go off-task. It's difficult because I really like the Lessons' level of vocabulary and I don't know how the tool developers can change it to ask it in a more simplified way because they're really hitting the content they need to. It's just one of the struggles with ELL in secondary schools because there's so much vocabulary they're not comfortable with because they're not exposed to that. Maybe we need a couple of Spanish versions to make it more engaging for ELL students.*

— high school math teacher (experienced tool user)

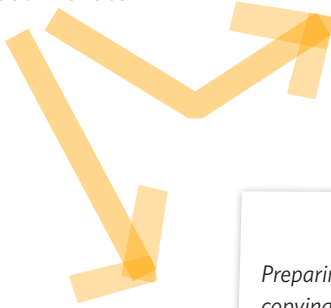
*The challenge is modifying the Lessons to make it fit our students' needs and wondering if that's allowed.*

— high school math teacher

### Teachers' reports of whether the Lessons take too much time away from covering curriculum topics are mixed.

Slightly more than half (54%) of teachers surveyed agreed that using the Lessons competes with the time needed cover required content, and 46% of teachers indicated that the Lessons did not take away too much time. In interviews, teachers reported a tension between covering material needed for state test preparation and using the Lessons, which take approximately 2-3 days.

**Preparing the Lessons is often a burdensome task.** Despite significant progress made by all teachers using Lessons in Year Two, almost half (49%) said that the preparation required for the Lessons is an impediment to using them.



*The prep was overwhelming but once I had all the materials, I enjoyed it. Yesterday, it took me three hours to cut these cards out. ... I feel like if they were already pre-cut, that would be very helpful. Another thing is all the materials that you have to have ready and prepared -- the markers and all, and I feel like I'd like this school to provide me with the funding. This is very expensive.*

—high school math teacher  
(first-year tool user)

*Preparing the material! The cutting and the copying and everything. That's the problem, the preparation. And if you have three class preps, it will kill you. And especially if you have first period, you have to come in early and print.*

— high school math teacher  
(experienced tool user)

*Alignment is much better than it was last year. I think there was a lot more thought and time and effort put into actually picking the tasks, and where they go. The issue was...this task would have fit much better 2.5 weeks ago. We chose not to do it then, based on the fact that we knew we would still have this time [professional development], so we chose not to do it then, but at the same time, it's a great reminder of it. So it's one of those things where it still kind of fits, so it's at least better. It's improvement; still working on it [alignment].*

**When professional development schedules drive Lesson use, it can mean Lessons do not fit with the curriculum.**

Even though most teachers say that the Lessons are aligned with their curriculum, 65% also reported that they had used a Lesson that was not aligned. In interviews, teachers explained that alignment was not always ideal because, while the Lesson guidelines indicate that Lessons should be used three-quarters into a unit, some teachers were required by administrators to a Lesson within a 2-3 day window to coordinate with planned professional development.

## What kind of professional support did teachers receive in Year Two?

Leaders provided teachers with a variety of formal and informal school and district-level professional learning opportunities (PLO) to bolster their use of the MDC tools. These supports varied by site (not all sites had all options below):

- District and network-wide meetings.
- Peer visits to see Lessons in use.
- Modeling and co-teaching with a district leader or professional development provider.
- Planning during department meetings.
- Informal conversations in-person, via email or phone with peers and district leaders to problem-solve and strategize around tool use.

### The most effective professional development focused on strategies to implement the

**Lessons.** Teachers reported that they benefited from working through the problems as if they were students, and observing or helping other teachers implement the Lessons. This allowed teachers to anticipate various questions or challenges their students might experience when they engage in a Lesson.

**Formal PLO:** *[At the PD session], they [PD consultants] introduced the Lessons - what it is, where we can find them, what it means, what is it used for. The most helpful was when we actually saw the lesson being taught, and how students responded to it. At most PD, they tell you how it can be done, what you're supposed to do, but you never see it in action. So actually seeing it was the most helpful.*



**Informal PLO:** *[My district leader] will come in at any time. If we were to ask, she will come in and work with a teacher, especially if someone is struggling with a class. She will come in and work with them. She will discuss with us ahead of time to coach with us, or she can help coach us through if we needed it, or she would be able to come in and work. She co-teaches.*

Teacher collaboration proved an important support for implementing Lessons. Ninety-six percent of teachers reported that their MDC colleagues were collaborative.

Collaboration with MDC peers helped teachers prepare for the Lesson, identify common student math misconceptions, and create feedback questions designed to elicit deeper mathematical responses from students.

We've met in the math department, prior to the Lessons, and whoever was going to be teaching that Lesson, we just discussed it, went through it, looked at it, what do I need, what problems do I foresee, what about the timing? And just trying to read through it, break it down, to make sure that it was going to be presented properly. So we have done that and it's been helpful. I mean, it gets me prepared, and instead of just doing it yourself, hearing, okay, well what about this, did you see that? So I think that's definitely helped.



It [pre-assessment] shows me exactly, okay they don't understand this topic, this is where we need to go with the Lesson tomorrow. [After the pre-assessment] Typically, I sit down with the other Algebra 1 teachers and we work together to create questions. It's funny because it's typically always the same [student] misconceptions popping up.

### Principals provided teachers with the time and resources to develop their knowledge and skills using Lessons.

In surveys and interviews, teachers said that their principals were supportive of their work using the Lessons. Eighty-one percent of teachers said that their school administration provided ongoing support for the implementation of the Lessons.

She [the principal] does a great job of setting up the time for math teachers to work together. If we need a sub so all of us can meet, she gets that done...I can't say enough good things.

— high school math teacher

She's [the principal] the one promoting these travels to the different [MDC] trainings, and giving us the means and opportunities to attend those. And she always, probably once a month, inquires about how the Lessons are going. She's always [asking] how are we doing on this [initiative]

— high school math teacher

### In some sites, teachers took on a leadership role to support and coach their peers. In some schools and districts, there was a formal role for teacher leaders.

In other places, teacher leaders emerged more organically and were seen as the “go-to” people for the MDC initiative. Teacher leaders have played an important role in implementing and scaling the tools. Teachers spoke of the importance of having a teacher leader at their school to:

- Field questions and discuss ideas about using the Lessons,
- Provide background and clarity about the Lessons,
- Share their experiences with the tools in the classroom, and
- Be available as a resource for ongoing and often informal technical assistance.

## More than half of MDC teachers would like to have more professional learning opportunities that address the following:

- Differentiating Lesson instruction in general.
- Differentiating instruction for ELL and special education students.
- Aligning Lessons to curriculum content.
- Facilitating classroom discussion.
- Providing feedback questions.
- Addressing student misconceptions.

## WHAT TO WATCH FOR

**Lack of time to collaborate was a barrier in many sites.** Even though teachers overwhelmingly felt that their MDC peers are collaborative, 40% reported they did not have regularly scheduled common planning time with them.

## What did teachers say about the impact of MDC on their practice?

**Using the Lessons helped teachers implement the CCSS.** Close to 80% of teachers said that using the Lessons helped them implement the CCSS.

**Three-quarters (75%) of teachers reported that using the Lessons have raised their expectations for students' mathematical work.** This is a very promising finding -- the Lessons, designed to raise the level of mathematical content by rooting them in the rigorous demands of the CCSS, are also increasing teachers' academic expectations for their students.

*I think it [MDC] goes along with it [CCSS]. I mean, we're already going along with the CCSS, it's [Lessons] just a good activity to facilitate, and give us something else besides our textbook to use. So, it goes right along with it.*

— high school math teacher



**Teachers are able to provide more student-centered instruction.** More than 80% of teachers said that using the Lessons has helped them establish a classroom culture of rich mathematical discourse, particularly through the collaborative and whole group discussion activities. This type of math classroom culture, where students “try to use clear definitions in discussion with others and in their own reasoning” (CCSS website), is a key standard of practice in the CCSS.



*The Lessons allowed students to have rich conversations; there was more ownership of their learning. Most of my students who are typically quiet and don't participate in class, they actually got that opportunity to participate. They know that they may not get all the answers correct or they may not finish the entire thing, but at least they'll get a good foundation.*

— high school math teacher  
(first-year tool user)

*The students actually talk about math and they are actually having debates and they are debating between who is correct. Before, without this type of teaching, they never talked about math. It was always the teacher talking and they never got into good discussions or justify their answers, and they were never responsible for understanding what other people were thinking as well.*

— high school math teacher  
(experienced tool user)

### Teachers are using MDC formative assessment strategies during other (non-Lesson) instruction.

Almost three-quarters (73%) of teachers are including formative assessment strategies throughout the school year, including giving students “think-time,” and providing class time for students to work collaboratively.

*This has expanded me to do more work in groups, even more than I have done in the past, and I keep going back to the pre-calculus class because those are the advanced kids - we had done a practice ACT test because a lot of them are taking it for the last time, trying to get their scores up. So I gave it to them for the last time, I scored it over the weekend with no comments on it, and handed it back to them today. I told them to work quietly for 30 minutes, making corrections, and they did. They worked very quietly, shared with their group, and let their group discuss. I mean, if I would have just told them the answer, 'Okay that's great.' But all of a sudden they were having to come up with different strategies and they were seeing, 'Well maybe this person did it a little differently than we did.'*

— high school math teacher

## What did teachers say about MDC and student engagement?

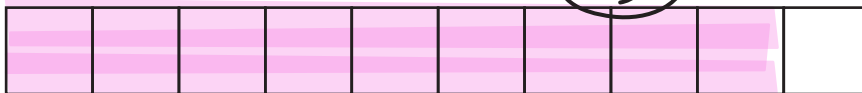
Almost two-thirds of teachers reported that their students were more engaged during the Lessons than they were during their regular (non-Lesson) instruction. Teachers described engagement as students asking more questions, understanding the bigger mathematical picture, staying more on task, participating in richer mathematical discussions, and actively participating. Thirty-five percent of teachers said their students found the tools as engaging as other teaching strategies, and only 3% said that the Lessons were less engaging for students.

Lessons help teachers engage a range of students in mathematics instruction. In particular, teachers reported that the Lessons were especially effective in engaging students with different math abilities and students who tend to be disengaged.

## THE LESSONS ENGAGED STUDENTS...

with different mathematical abilities

89%



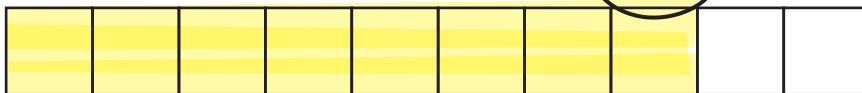
who tend to be disengaged

88%



classified as needing special education

80%



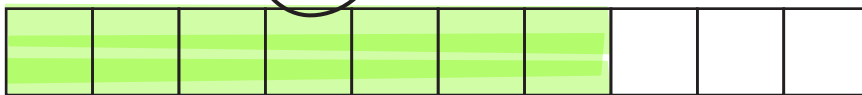
who tend to be disruptive

75%



classified as ELL

70%



Teachers realized that student engagement varied depending on which of the four components was in use -- pre-assessment, collaborative activity, plenary discussion, or post-assessment. In interviews, teachers noted that student engagement increased as students became more familiar with their new roles and responsibilities during the Lesson. Moreover, some sections, such as the collaborative activity, elicited more student engagement than others.

*There was more engagement, especially toward the middle and the end part. It started kind of rough, getting them used to what was happening. But then in the middle, you saw them take responsibility, talk to each other, and work on their own. So, that's what I saw, more engagement at the end.*

— high school math teacher

*I think it's still a process for them, being with me - the fact that I'm not going to tell you that this is right or wrong. I might ask you questions to further your thinking, or to engage you in a different way. But the fact that I'm not going to tell you this is right and this is wrong, or you need to move this here, I think that's still a struggle for them.*

— high school math teacher

## WHAT TO WATCH FOR

**Student engagement with the Lessons can take time.** One of the more compelling findings from the interview data was the number of teachers who commented that student engagement with the Lessons was not necessarily automatic or present at the beginning of the Lesson. Rather, teachers noted that student engagement increased as they became familiar with their new roles and responsibilities within the various components of the Lessons:

*Today when they first saw the activity, most of them said, 'I can't do anything.' And some of them tried a few things. ...I had a little bit less participation than I normally do with them but I gave some examples and they were starting to move in that direction, get an idea of what was happening and what they should be doing.*

— high school math teacher (experienced tool user)

*They aren't comfortable with their expected roles of asking each other questions or discussing. ...I think that the more we do this, the better the culture will be. It's just difficult to start that way... My most difficult thing is they are afraid to fail. They don't struggle and get the wrong answer. They struggle and stop.*

— high school math teacher (experienced tool user)

## What did teachers say about Lessons and student learning?

Teacher interview and survey responses demonstrated that teachers' reports of the Lessons impact on student learning were more positive and definitive in the second year of implementation.

**Teachers saw evidence of increased student content knowledge.** Ninety-two percent of teachers observed growth in understanding of math content after reviewing the post-assessment.

*There weren't any groups that didn't figure out what they needed to figure out. Every group came to a conclusion that was correct.*

— high school math teacher

*I've been able to use the Pythagorean Theorem Lesson...I completed it with my geometry class...I'm very excited because I did the post assessment last week, and all my kids got good grades. They were able to get the areas and draw the titled square. So I was very happy...Yes [I see growth from the pre-assessment to the post-assessment]. I never approach the Pythagorean Theorem that way, and I think it's a great way.*

— high school math teacher

**Most teachers observed additional academic benefits when using Lessons with their students.**

Teachers said that Lessons help prepare students for both post-secondary success (79%) and state math assessments (82%). Eighty-nine percent of teachers also said that their use of the Lessons improved their students' mathematical reasoning skills:

*I felt like that one [the time-distance graph] really, really helped their reasoning skills. They all misinterpreted the graphs at the beginning and then, by the end ... the majority knew how to read the graphs and look and see that, if it's going up, that doesn't mean that he's going uphill. It means that his distance is increasing, whatever it was. So, I thought that that one really helped their reasoning skills and their ability to read a graph.*

— high school math teacher

Teachers said that using the Lessons has helped their students develop new ways of thinking mathematically. In interviews, teachers said that students were:



### **Discovering new methods of solving the same math problem.**

*Looking at the different student responses afterwards was really helpful, because there was one response that was just narrative, and there was one that was a chart, and there was one that was using algebraic equations, there was one that was using a graph. So, one student is not going to think of all four of those strategies. But in a group, you might see two or three of them. It's cool for them to see - my way was good, but I could have done that too, because maybe next time, the problem lends itself more to using a graph as opposed to using a chart, and they feel more comfortable with it.*

— high school math teacher



### **Participating in rich mathematical discussions.**

*The one I am doing today in my geometry, which is actually an algebra I task, I did with my pre-calculus last trimester when they got started at the beginning of the year. They had a phenomenal discussion on that task, on whether an equation is always true, sometimes true, never true - the identity one. They got to task on that, and we came back the next day because they had so much good discussion with each other that we spent almost two days working on that in a pre-calculus class. They were into talking about why and learning how to draw the pictures, because they hadn't experienced that.*

— high school math teacher



### **Making connections between mathematical concepts and real world applications.**

*I think it was great because, with these Lessons, a lot of them are not only using a little bit of their prior knowledge and putting the pieces together to learn a new concept, but they are also relating to real world situations. So they could actually see Tom leaving home, they knew what was going on in all of these situations. They could see that Tom is leaving the party and going home, and so on the y axis they know where to place Tom in these situations. So they are using a real world situation in a mathematical way but don't realize it. They are doing math.*

— high school math teacher

## WHAT TO WATCH FOR

**Students' comfort level in persevering through difficult math problems and adjusting to the new student and teacher roles was mixed.** An important goal of the CCSS of mathematical practice is that students persevere through difficult problems. In the case of the Lessons, students must learn to persevere while at the same time adjusting to the new teacher and student roles. This new role requires teachers to facilitate discussions by asking guiding questions instead of teaching through direct instruction or giving students specific answers to their questions. Classroom observations of teachers using the Lessons revealed that there was not much consistency or uniformity in how teachers introduced the Lessons to their students, how they explained both the roles of students and teacher, and teachers' expectations for students during the different components of the Lessons.

## Questions for Teachers to Consider

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As noted earlier, our intent with this booklet is to capture both the experiences and voices of teachers who have been using the Lessons, and to share their insights with other teachers – those considering using the tools and also those familiar with them. In an effort to prompt discussions and reflections, we pose the following questions for you to take up in your own departmental meetings. Some of the questions will be applicable, and some will not, depending on your experiences and familiarity with the Lessons. These questions are intended to start the conversation; you will add and ask your own questions.

1. How has your work with MDC impacted your practice? What successes and challenges have you experienced?
2. How can you support your colleagues who are just beginning to use the Lessons? What kind of support do you need/want from your colleagues?
3. What strategies do you use to adjust instruction to individual student needs?
4. How do you and your MDC colleagues collaborate? In what ways has collaboration helped you with Lessons? Describe any areas where you would like to have more opportunities for collaborating about MDC?
5. What strategies do you use to provide detailed feedback on student work?
6. What have you found to be the most effective grouping strategies for the collaborative portion of the Lesson? Do students take on specific roles within the groups?
7. What are the three most important things your district and school leaders can do to better support your use of the Lessons?
8. What have you learned as a result of participating in the MDC initiative that you would like to share with a teacher who is new to the initiative?

If you and your colleagues have additional comments about your involvement in the MDC initiative that you would like to share with us, Lesson tool developers, or professional development providers, please send them to:

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