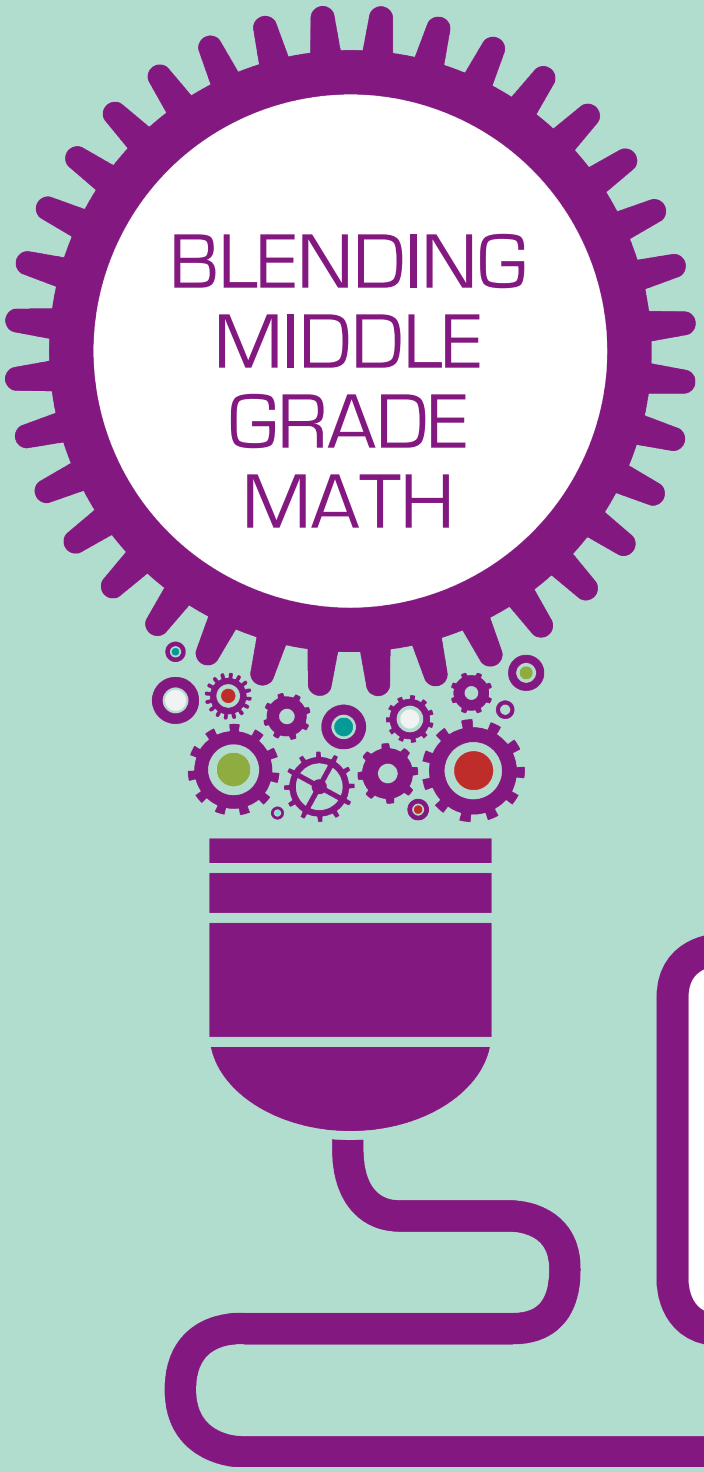
GETTING SMART ON



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Introduction

Authored by Megan Mead, Project Manager and Math Contributor at Getting Smart.

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Make or Break, Why Middle School Math Counts

The middle school landscape is interesting no matter how you spin it, but combine students' physical and emotional changes with new and difficult content, and educators and students alike face unique challenges. Middle school is a time of development, discovery and transition for students—but also an exciting and powerful time for math education. As we look into successful middle school math blends, it is key for us to better understand the difference between primary and intermediate math students. How do we increase motivation, build persistence, support the transition into a more independent educational experience, and prepare for future success?

Learning that is student-centered provides a key framework for curriculum design and instruction in middle grade math. The Nellie Mae Education Foundation's vision offers four tenets to describe student-centered learning. The four tenets are: Learning is Personalized; Learning is Competency-Based; Learning Happens Anytime, Anywhere; and Learning is Student-Driven. These tenets are essential for Deeper Learning and for high levels of student engagement in any content or subject matter, and are highlighted below as examples of best practices in blending middle grade math.

1. **Support the Change through Learning that is Personalized.** If there is ever a time when students question themselves and their confidence, this is it. Why not help students cope with the changes in environment by acknowledging them as individuals? A new physical space, content specialists, and more independence can be exciting, but they can also make kids nervous. Middle school students enter the classroom with a wide range of contextual understanding and a high need for a personalized learning path. Blended and personalized learning opportunities not only foster high levels of engagement, they also build confidence through student-centered learning environments, where students are able to fill gaps in understanding or advance beyond grade-level content, leading to increased proficiency. A flexible rotation model, such as that used by KIPP Schools, can provide the flexibility key to success in a middle school blend.

2. **Motivate to Succeed with Learning that is Competency-Based.** Middle school students desire more independence yet may not be ready to be completely on their own. This is an essential time to help students take ownership of their learning. A competency-based system, where students must demonstrate mastery of content prior to moving on, can help develop lifelong learners, who take control of their education. Help students identify those skills or concepts they understand well and those with which they need more work. Provide options to expand their learning experience while staying organized. Support them in asking for assistance and clarity and utilize peer tutoring to encourage productive collaboration (see Reflections on Khan Blends as an example of this). Most importantly, celebrate their success. With new EdTech tools and blended learning software, teachers have more data available to them than ever before. Teachers are trained to make data-driven decisions; middle school is a good time to share that data with students and encourage them to access and understand their own data.

3. **Build Persistence through Learning that is Student-Driven.** Until this point in students' math careers, math may not have seemed that hard. We need to make sure that students are comfortable with making mistakes as part of the learning process. Elementary math often provides a level of instant gratification—you see the problem, you know the answer. In middle school, the math starts to get more complex, building connections among content. We need to help students practice patience, use a variety of solving techniques to attack problems, and learn from their mistakes in order to persist through difficult math situations rather than simply giving up. Part of this includes presenting problems and challenges that are interesting to the students. Good examples of real-world problems are those presented in the Math@Work series from Math 180. By creating student-centered experiences that engage learners and build knowledge around their skills and interests, we help them build context and thus greater understanding of how the content fits into the world around them.

4. **Look Ahead; Learning Happens Anytime, Anywhere.** They may not be writing college applications or resumes just yet, but middle schoolers definitely start developing ideas about their futures. When it comes to jobs, STEM is "where it's at." If you need any help convincing your students that STEM careers are worth pursuing, check out Why STEM Education Matters from the National Math and Science Initiative. According to the U.S. Department of Commerce, the next 10 years will see significantly more STEM jobs than non-STEM jobs, and individuals in these fields will be less likely to struggle with job loss and earn an average of 26 percent higher pay. "As a society, we desperately need students to be proficient in mathematics so they can succeed in high school, college and the future workforce," says Matthew Peterson, creator of ST Math and co-founder and Chief Operating Officer of MIND. Help students prepare for the future by taking the learning beyond the traditional experience. Show them that learning happens anytime, anywhere—not just in school.

Although it presents an interesting challenge, middle school is also prime time for making positive change. Wouldn't it be great if instead of looking back at middle school as the awkward years, students remembered middle school as the time when they fell in love with math? Here's to hoping!

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Reflections on Khan Blends

Authored by Tom Vander Ark, Founder and CEO of Getting Smart.

It was a visit to Eastside College Prep in East Palo Alto that inspired Scott Ellis to "really dive into blended." The math class using Khan Academy also impressed 60 Minutes (here's a short video description). Ellis had five important observations:

1. **Framing.** The teacher provided great framing at the beginning of the class. She said to everyone, "Remember, we all learn at different speeds, and that is a good thing. Some of you are still working on the content from the multiplication unit, and I will be helping you in a small group over here. For the rest of you, first work on your homework, then do your Khan Academy, then your other assignment. Ready? Go." Then she sat and worked with about five students in a small group with a miniature white board, while the others all got up and pulled their laptops out of the cart in the back of the class and got to work. She had the sequence of activities written on the whiteboard.

2. **"Show what you know."** The students were using Khan Academy. They were all also using paper notebooks and were required to show their work and turn in their notebooks, though they submitted their answers in Khan. So she could see whether they were getting the answers right in Khan but could also see where the kids were making errors from their notebooks. As I walked through the classroom I could see this process play out.

3. **Peer tutoring.** She put two columns on the whiteboard: "Needs help" and "Offers help." At one point in the class, Jessica went up and wrote her name under "Needs help" and listed rounding decimals as her topic. Within a minute Anthony got up and wrote his name under "Offers help," and then he sat next to her and helped her with it. There was no involvement from the teacher. This was really neat to see, and I am quite certain that their roles would have been reversed in another class.

4. **Workflow.** Each student had a piece of paper with the list of topics to do in Khan Academy–I think there was a sequence of about 10 elements. As a student would get the necessary number correct in Khan, he or she would use a pencil and check off the item on the list, then go on to the next one. It seemed really helpful for the students to have this list, so they could see where they were and what they needed to do next, and they were all at different places on the checklist.

5. **Tech Support.** Having the tech work well was critical. One boy's laptop had not been fully docked in the cart, so its battery did not charge. When he found out it was dead, he started chatting with the girls, etc. And another boy was chugging along, but then the wireless slowed down. He started getting frustrated and pounding the return key pretty hard as he tried to get it to refresh. Both of these situations got addressed quickly, and the whole class worked really well. But it is very easy to see how everything falls apart quickly if the tech is not in place and working seamlessly.

A recent SRI report on Khan Academy recapped use in nine pilot schools. Key findings included:

- Student perceptions were positive. Seventy-one percent of students reported that they enjoyed using Khan Academy.
- Eighty-five percent of teachers reported that the use of Khan Academy had positively affected their students' learning.
- Teachers appreciated the modular architecture, but lack of alignment with core curriculum posed a challenge for most teachers, and some found it hard to find the right content for specific standards.
- There was little flipped classroom use and less video access than anticipated. (These findings are a little different than in Khan's book, The One World Schoolhouse: Education Reimagined.)

One site had stronger use relative to others as a result of one-to-one access, mandated completion of Khan Academy goals, close teacher monitoring of progress, a well-planned integration with the core curriculum, and a 90-minute math block.

The SRI report concluded that the role of the teacher is critical when adopting new technology in the classroom. New tools can assist teachers in their regular interactions with students, enabling them to have a positive impact on student learning, helping to build strong relationships with their students, and developing a deeper knowledge of the skills their students possess.

Lessons from KIPP Math Blends

Authored by Tom Vander Ark, Founder and CEO of Getting Smart.

Anirban Bhattacharyya led the development of blended learning pilots at KIPP Chicago. As the Digital Learning Director for the KIPP Foundation, he is working to develop a national strategy to support the implementation of next generation learning models that leverage innovative instructional technology at KIPP schools.

As suggested in the Blended Learning Implementation Guide, Bhattacharyya helped KIPP Chicago set clear goals for their digital conversion:

- Support transformational academic achievement,
- Enable high-leverage instructional models,
- Facilitate data-driven instruction,
- Enhance digital fluency, and
- Support sustainability.

The default blended learning model for middle schools has traditionally been lab rotation, where a classroom rotates to a computer lab and engages in online learning for one period. Bhattacharyya observed that because middle school teachers are departmentalized, traditional lab rotation models typically don't impact core instruction.

Flexible Lab Rotation. "We have seen many successful middle schools implement large and flexible lab rotations instead of traditional lab rotations or station rotations," said Bhattacharyya. This gives teachers the flexibility of either being in the lab, working with small groups in their classrooms, or doing something else entirely. It also reduces the necessity of teachers having to teach an unfamiliar subject if there is a school-wide small group curriculum aligned to a subject area (e.g., guided reading). Features include:

- Lab has more than one classroom of students, which enables small group instruction in other classrooms.
- Students can switch days or periods between lab and small group rooms.
- Lab adult(s) may not need to be credentialed teacher(s).
- In lab, student-to-adult ratio can be larger than traditional class because of the engagement of the software.

Team sport. "We have seen elementary schools adopting station rotation models successfully because stations are already common features of elementary schools," said Bhattacharyya. Moving from blended classrooms to school-wide transformation requires a common vision for personalized learning. School (or district/network) leaders need to shape:

- Instructional design, including instructional priorities, academic goals and teaching competencies.
- School model design, including schedule and physical space; staffing and performance management; operations, finance and development; and blended learning models.

Middle (and high) schools are traditionally more likely to default to whole-group instruction and less likely to have school-wide instructional visions. Bhattacharyya notes that historically, instructional vision has been decided by each content area teacher or department, with little ability to impact the school model. Facilitating the adoption of a school-wide design is a new role for many school leaders.

Rotation models without connection to school-wide instructional design and school model design are possible, but they make particular demands of teachers. First of all, teachers must be great classroom managers since students won't be held to standardized expectations from the school in multiple classrooms. Second, teachers must be "tech savvy" since ongoing professional development (PD) is less likely. Third, teachers must be "data savvy" since the data from online programs are less likely to be incorporated in school-wide "data dives." Lastly, teachers must be able to justify the investment without help from others.

Blended Schools. The 975 students in KIPP Chicago are nearly all African American students from low-income families. Three models are used across the four campuses:

- Tech-infused instruction
- Classroom rotation, a mix of teacher-led and independent centers, some of which feature adaptive content
- Lab rotation

In the middle schools, ST Math is used for students below grade level, Think Through Math is used for students on grade level, and Khan Academy is used to review important standards and facilitate engagement. Student access is provided through a combination of tablets and Chromebooks.

Executive Director April Goble and the KIPP Chicago team found that strong classroom management is key to ensuring success of instructional technology. They also found that teachers benefit most from synthesized, actionable data—and training on how to use it.

Teachers need to know how to use the programs. KIPP Create, a KIPP Chicago middle school that opened in 2012, employs the large, flexible lab model discussed above. School leader Kate Mazurek has designed a model where half of a grade level is in the lab working on online math programs and small group lessons, while the other half is in classrooms in small groups working on other subjects.

Students switch between lab days and small group days. In New York City, KIPP Washington Heights also employs a large, flexible lab model for a class called Math Computation. The school leader, Danny Swersky, has designed a school where Math Computation is taught in a large, flexible lab and guided reading is taught in small groups simultaneously.

At KIPP Foundation, Bhattacharyya and Michelle Bruce, Director of Technology and Technology Innovation, support KIPP schools as they design blended learning models that align to their instructional visions and school model designs. Instructional technology leaders meet several times a year to share successes and tackle common challenges. This formal collaboration often leads to leaders from around the country working together to solve problems. Furthermore, KIPP instructional technology leaders have shared and collaborated with leaders from other charter networks and public districts as well. Bhattacharyya observes that "[t]here are so many combinations and permutations of models, hardware, software, etc., that constant communication and collaboration between all leaders working in blended learning is necessary so we collectively move forward and positively impact teaching and learning."

Summer School: A Great Time to Try Blended Learning in Middle School Math

Tim Hudson is the Senior Director of Curriculum Design at DreamBox Learning.

When I was the Math Curriculum Coordinator for a K-12 district, I had the privilege of being a co-principal investigator for a three-year, $1.5 million federal Math-Science Partnership grant designed to improve the pedagogical content knowledge of middle school mathematics teachers. Partnering with another school district and a local university, we created an innovative professional development opportunity in which teachers worked directly with students in a unique three-week summer program called the Mathematicians in Residence (MIR) Academy. Each summer for three years, we held the MIR Summer Academy, which included around 40 teachers and 200 students. Though our program wasn't a blended learning initiative, schools and districts interested in testing blended learning could use this Academy as a model from which to build a blended learning pilot or program.

Defining Learning Outcomes

As with any school design plan or initiative, building a blended learning model should begin with establishing the learning goals. The overarching goal of the MIR program was to improve middle school math teachers' content knowledge as well as their comfort and ability to create true communities of mathematicians in their classrooms. We decided to focus on number concepts and algebraic reasoning, and we used materials from the Young Mathematicians at Work series and the Contexts for Learning series by Cathy Fosnot and colleagues. Given that teachers were learning how to build mathematical communities, it was important to involve students.

Bringing in Experts

Having defined the learning outcomes and identified the necessary support materials, we next needed to choose facilitators for our program. We aimed high and invited Cathy Fosnot herself to facilitate the professional development (PD). We were thrilled that she accepted, and that she was excited about the unique design of our program—especially the inclusion of students. Over the course of the three years, our teachers also had support from her colleagues and co-authors Maarten Dolk, Janan Hamm, Kara Imm and Bill Jacob. This amazing team of facilitators was uniquely equipped not only to help teachers more deeply understand mathematics, but also to assist teachers in learning to build strong mathematical communities within their middle school classrooms.

Scheduling and Structures

For anyone interested in testing out blended learning in a summer school setting, the structure and schedule of our three-week MIR program could be a starting point. First, we only met Monday through Thursday because we decided that having Fridays off during the summer would be a welcome benefit to both the teachers and students who were choosing to participate. During the four days of the first week, students weren't involved. Instead, Fosnot and her colleagues modeled the same mathematics units and lessons with teachers that the teachers would be using with students in the second and third weeks. Because of this design, teachers were directly immersed in the mathematics content and were able to see how the resident experts facilitated a mathematical community for the teachers as students.

Including the Students

Grant funding enabled us to use buses to bring students to the MIR Academy during the following two weeks. Students entering grades 6, 7 and 8 were placed in classrooms of 12 to 15 students with two to four teachers. Small class sizes and multiple teachers in each room were necessary to accomplish the goals of the grant. It also impressed parents and surprised students because it was a much more personal learning environment than they were used to. The MIR sessions were three hours each day—from 9 a.m. to noon—which meant there was plenty of time to build mathematical communities, tackle challenging math problems, engage in rich conversation, and present conclusions and solutions to their class and other classes. After students left on the buses at noon and teachers had lunch, the rest of the afternoon was spent in grade-level specific groups facilitated by Fosnot and her colleagues. Every afternoon, teachers reflected upon their successes and failures from earlier in the day and made class plans for the following day. By design, the PD was always personal and relevant for teachers.

Tim Hudson from DreamBox Learning joined Tom Vander Ark and Megan Mead for a little chat about intermediate math. Motivated by the fact that these formative years are key in the development of lifelong mathematical understanding, they delved into the importance of teaching Algebra Reasoning in the early grades, how to build key connections for students and why thinking about intermediate students a little differently can help build a community of mathematicians.

Original blog post featuring Google Hangout.

Funding, Hardware, and Software

For programs like this one—or any blended learning initiative—sustainable funding is always a key consideration. For the MIR program, the $1.5 million grant enabled us not only to bring in outstanding PD facilitators and include hundreds of students, but also to provide supporting technology tools for teachers to use in the classroom. With a laptop, document camera and LCD projector, teachers were well equipped to immediately highlight student work in the classroom for discussion. At the time, there were few online resources for teachers to use to engage students in meaningful conversation. Now there are far more digital tools and manipulatives like the free DreamBox Teacher Tools available for pre-K-8 teachers who want to use number lines, arrays, and other useful representations that help students make sense of concepts, model their solutions, and communicate their thinking. Given the learning outcomes of the MIR Academy, many of these digital tools would have enhanced conversations between teachers and students during class had they been available. Also, had the MIR Academy been a truly blended learning model, students could have accessed the adaptive software at home as a way to complement the classroom and continue personalized learning outside of three Academy hours.

Other Summer Blended Models

Depending on access to funding and technology, there are other ways to try blended learning in your own summer school circumstances. Some districts have daily two-hour blocks for math in the summer, which are ideal for setting up a station rotation blended learning model. In that amount of time, students could spend around 45 to 60 minutes in a whole-class mathematical community, and 30 to 45 minutes using digital learning software while the teacher works with individual students or small groups. The best model in any given situation will depend on access to hardware and choosing software that aligns with rigorous learning goals, enables students to be self-directed, and enables them to receive immediate feedback and scaffolded support from the software itself.

Results: Improving Classrooms and Critical Thinking

By the end of the MIR Academy, there was a significant change in how well teachers understood middle school math content and how well they could create a mathematical community where students thought critically, constructed arguments, and critiqued the reasoning of others. That success stemmed from having a clear focus on learning outcomes, strong collaboration among teachers and with students, and the strategic use of classroom time and technology depending on the learning goals. These are key ingredients for success when implementing blended learning models: focused goals, strong collaboration and strategic technology use.

Middle Grade Math Blends: 10 Lessons Learned

Authored by Tom Vander Ark, Founder and CEO of Getting Smart.

We've been studying middle grade math blends, and with the help of guest authors and partners we've observed 10 lessons.

1. **School-wide.** Blended classrooms can be beneficial, but blended learning is a team sport and requires a common vision for personalized learning. The KIPP Foundation suggests that school leaders need to facilitate:

    - **Instructional design**, including common instructional priorities, academic goals and teaching competencies; and
    - **School model design**, including schedule and physical space; staffing and performance management; operations, finance and development; and blended learning models.

2. **Data.** Teachers benefit most from synthesized, actionable data that identify groups of students and areas for remediation. But students benefit from data, too. In fact, frequent feedback is necessary for students to take charge of their learning. "Teacher data is important," says Alex Hernandez of the Charter School Growth Fund, "but, if we really want students to take charge of their learning, we can't forget about the data going to students. Student-centered schools value direct feedback to kids, and lots of it."

3. **Alignment.** Key to a sound blended learning instructional design is component alignment (e.g., alignment of core and supplemental instructional materials). The introduction of powerful adaptive tools can be very beneficial, but they can make the math program feel disjointed to a student.

    A unified blended learning program like the one used by Summit Public Schools or Michigan's EAA (usually called an individual rotation) creates coherent pathways for individual students.

    Aligned programs seek to calibrate difficulty—between frustration and boredom—with what Tim Hudson of Dreambox Learning calls "appropriate scaffolding—strategic social interactions, learning experiences, and instruction based on a student's past performance, intuition, and current thinking—that guide effective learning and development."

    When components including a mixture of teacher-led and adaptive instruction are used, data can help align instructional elements. Encinitas teachers often use the ST Math game on an interactive whiteboard to start a conversation about math applications and to boost math vocabulary. Principal Stephanie Casperson explains that this bridges the gap between the classroom and what happens in independent practice and encourages a deeper understanding of difficult math concepts. "Kids understand the process before the teacher has even started teaching."

4. **Management.** KIPP Chicago teachers found that strong classroom procedures and classroom management are fundamental to ensuring success of instructional technology.

    Alliance, a Los Angeles secondary network, created digital learning agendas so it was clear to each student what they were to be working on at each station. Cheryl Niehaus said, "From a logistics standpoint, that might help ease teacher concerns of time on task for middle school students."

5. **Pay attention to motivation.** Niehaus said, "FirstLine Schools is very thoughtful in how they approached the question of student motivation during the online learning component." They use a goal-setting process with students around what they are to complete as well as when incorporating some competitive elements based on student progress.

   Help kids set goals for, say, a week's worth of time on the computers. "I'm going to master these four modules on Khan...," for example, and then help them reflect on those goals and learn from their progress (or not). Don't harp on whether they're "engaged" every single minute of the week's worth of rotations. Set the goal and hold them accountable at the end. We need to build up their ability to self-regulate over longer stretches of time.

6. **Support.** With strong support, said Elizabeth Stock of CFY, even teachers who are not eager to teach in a less teacher-centric and lecture-focused way can learn how to implement blended learning effectively, and they become enthusiastic about the results they see with students. A teacher in a Los Angeles Unified School District partner school remarked that before working with PowerMyLearning, her classes were completely teacher-centered and lecture-focused. At that time, she was not aware of how to teach differently, but now she cannot imagine going back to the way she used to teach.

   KIPP Chicago found it important that teachers understand how to use programs with fidelity (e.g., as recommended by content developers) to best enable teachers to evaluate results. Teachers should be sufficiently trained on acting on data from programs and on creating systems and processes required for streamlined procurement and data integration.

7. **Tech support.** "Sweat the small stuff when it comes to maintaining the technology," said Greg Klein, Rogers Family Foundation. "Make sure the keyboards and mice are left neat and straight, charge all the laptops going the same direction." Scott Ellis, The Learning Accelerator, echoed the need for good tech support—as well as a classroom culture of peer support and collaboration.

8. **Start whole-group.** "Early on when teaching kids how to use the online content, use whole-group instruction," said Klein. "I definitely had teachers who wanted to release a group of kids to computers on Day 1 and pull a different small group themselves, leaving too many kids to have to figure out too much on their own."

   Klein added, "Let kids practice using and learning the program using math content/lessons that are easy for them. [It's] hard to learn how the program works and how the math works at the same time."

9. **Portfolio blend.** "Over time, develop a portfolio approach to content, matching different programs for different kids for different learning needs/styles," said Klein. "As much as possible, let kids choose which program they need to use and tell you why."

   "A platform like PowerMyLearning that gives teachers a lot of control (instead of being 'teacher-proof') can support teacher growth and professional learning communities," said Stock. In successful partner schools, teams of teachers meet several times each week to review how their students are doing and discuss resources that the teachers can use to help their students' progress.

10. **Flexible.** We're all in the early innings of figuring this out. Visit/review as many models as you can (see NGLC profiles, and Blended Learning Universe). As recently suggested, take an iterative approach: develop and test hypotheses on short cycles. Sweat the culture as much as the design—and be good to each other.

Smart Balances in Smart Blends

Authored by Jason Zimba, a lead writer of the Common Core State Standards for Mathematics and is a Founding Partner of Student Achievement Partners.

It can be a difficult challenge for teachers to meet students where they are and also teach grade-level mathematics. Negotiating that tension is the subject of this post, in which I'll offer some thoughts on striking smart balances in rotation models. I've also included thoughts from two mathematics teachers, Allyson ("Ryan") Redd of North Carolina and Peter Tang of Tennessee.

One condition for striking a smart balance comes from the K-8 Publishers' Criteria for the Common Core State Standards for Mathematics . There it is stressed that the mathematics curriculum should give all students extensive work with grade-level problems. This should be true for blended classrooms as well as traditional classrooms.

Why is this important? Instructional coaches are familiar with the phenomenon of "fractions forever." Students who leave elementary school without a solid grasp of fractions can end up "getting the fraction treatment" from sixth grade onwards. The treatment continues year after year, despite its lack of success, and in the meantime the student has lost the opportunity to learn algebra.

As teachers know, unfinished learning from earlier grades is normal and prevalent. It shouldn't be ignored, but it also shouldn't be used as a basis for canceling grade-level work. Fortunately, middle grade mathematics offers opportunities to handle unfinished learning in the context of the grade level. For example, instead of turning an eighth grader around and frog-marching him back to fractions (or, worse, airbrushing fractions out of the algebra textbook), algebra problems could become occasions for some students to practice weak fraction skills and revisit fraction concepts in a new light (such as the idea that fractions are quotients, for example). Ideally, rotation models could provide individualized help in the context of grade-level content.

A related boundary condition is that rotation models should regularly allow time for the whole class to concentrate together on the same well-designed, carefully sequenced problem. This is a mode of classroom work in high-performing Japan. Inevitably, some students in the class will use clumsier methods to solve the problem—perhaps concrete approaches based on much earlier mathematics.

Other students will use more abstract or powerful methods, closer to the new methods that the problem is aiming toward. The teacher then helps students in the class to understand each other's methods. Thus, the teacher doesn't see it as his job to give each student "just the right problem" for him or her at that point in time; all of the students are working on the same problem. Nor, however, does the teacher ignore the very real variability in his classroom. Indeed, the teacher sees it as his job to decrease the variability in students' approaches, in such a way that every student moves toward the mathematical goals of the lesson. That is roughly what it means, in such a system, to say that you are teaching the class the mathematics of the grade.

Ryan Redd, an instructional coach and eighth grade mathematics teacher, sees the value of this approach. She says, "Students benefit from seeing multiple ways to solve a problem. Sometimes with rotation models there is only one view of a problem, and the student might not be able to access the problem in that particular way."

What happens when individual student needs become extreme? Peter Tang teaches seventh grade mathematics in a school where a significant number of the students are behind by three or more grade levels. He says, "I work hard to scaffold grade-level work for these students, but it's a struggle." Peter uses a rotation model to handle the extreme differences in his classroom, stressing the benefits: "Essentially, rotation lowers my class size, which makes it easier to have conversations with my students about academic content.

Personalization has a role for the most able students as well. One thing high-performing students need is challenging problems—and that doesn't necessarily mean out-of-grade-level content. Problems that are challenging for highly able students can be created based on grade 8 content and it would be helpful for rotation models to leverage this fact.

A final boundary condition: ensure that the large majority of students' time is devoted to major work. New technologies and digital tools offer exciting opportunities for individualized and nonlinear paths, but they should not turn the curriculum into a random walk through the content landscape. The strong focus of the Common Core on arithmetic in grades K-5, and the coherent progressions to algebra in grades K-8, are the North Star for bringing students to college and career readiness and STEM readiness in mathematics. No blend is smart enough to compensate for a mile-wide, inch-deep curriculum.

Conclusion

Authored by Bonnie Lathram, Project Manager at Getting Smart.

Student-Centered Learning in Math: A Call to Action

Math preparedness remains at the forefront of the discussion around college readiness and is a hurdle for some of our students. Many states now require that students pass math tests in order to earn their high school diploma. For many students, this is one more item to "check off the list" while in high school. Some students, however, struggle each year to pass the test.

At the middle/high school where I worked, we encouraged our teachers to talk to their students about "growth mindset," the concept advocated for by Carol Dweck and others. Simply stated, having a growth mindset means that you know that hard work creates results. You are able to put in the long hours because you believe you can learn the concepts and you don't believe that intelligence is fixed. In other words, you believe you can learn.

We need to talk to our students about grit and tenacity. We should encourage them not to say that they are "bad at math," and instead replace those words with a more positive mantra, such as, "I am working hard, learning, and getting better with math each and every day."

This "growth mindset" approach in classrooms and in schools is part of a larger strategy around student ownership of their own work. This includes students' knowledge of their own skills, knowledge of their strengths and their struggles, and an ability to advocate for and ask for help as needed. It also means understanding how the learning relates to them personally and fits in with their interests, as well as how the learning can be applied in the real world. In other words, adopting a "growth mindset" helps create an environment where the math is truly student-centered. The student-centered framework of the Nellie Mae Education Foundation provides a great way to think about ways in which we can encourage these tenets in our classrooms to improve outcomes in math for learners.

If am a middle school student, here's how this framework could be applied for me in my math learning:

- Competency-based Math. Yes, I want to be challenged. I want to know that I am not simply going to move ahead in math simply because "that's what middle schools do" but instead know that I am moving ahead because I have mastered key concepts. I want the opportunity to be able to show that I can do the work.
- Learning is Personalized. I love to be able to bring my own interests into my schoolwork. I appreciate the opportunity I have to teach others what I am learning and to be a part of group work where my fellow students and I collaborate on challenging "problems of the day" and where we work together to come up with solutions.
- Learning is Everywhere. I enjoy knowing that what I am learning in math really does matter outside of school. I want to take that math knowledge everywhere with me and understand, and have experience with, applying the math outside of the classroom. I like it when my teacher presents us with real opportunities for engaging math in the real world. I also like it when I am encouraged to come up with the ways in which math applies to learning everywhere, at school and beyond.

BUNDLE RESOURCES:

1. Next Generation Blends Will Teach to One
2. Aspire's Blended Learning 101 Handbook
3. Blended Learning Implementation Guide, a Digital Learning Now paper
4. Assessing Deeper Learning: A Survey of Performance Assessment and Mastery-Tracking Tools
5. The Shift from Cohorts to Competency
6. Better Blends With Visual Game-Based Math, a MIND Research Institute paper
7. The Future of Learning: Personalized, Adaptive, and Competency-Based, a Dreambox white paper
8. Making Math Work, a Dreambox white paper
9. Guidance on CCSS teaching practices, National Council of Teachers of Mathematics
10. 125 Top Blogs on Blended Learning
11. How Digital Learning is Boosting Achievement

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- Learning is Student-Driven. I want to understand my own strengths and struggles with math, and I have a personalized relationship with my teacher so that I can really drive my own learning. I want to be able to utilize technology to enhance my own learning and be an authentic creator for my own math learning. This is preparing me not only for high school math, but also for lifelong love of learning across a variety of content areas.

Yes, middle grade math matters. We have a unique opportunity in the middle grades to influence student perceptions of math, their own "growth mindset" when it comes to learning math (or learning anything, for that matter), and their own ways of understanding how learning can be personalized to them. We know that math is so important as we prepare our students for college and beyond. As others have mentioned, we need to ensure we are giving students an opportunity to learn at grade-level content or beyond, and that we are finding ways to help students who need additional support in math while keeping them involved in deep and meaningful ways in their math class. Students who get stuck on working with "fractions" for years while not advancing into algebra may not only be bored, but also get further and further behind. Encouraging students to work together and work with technology using blended approaches can keep the learning engaging for students at every level.

Finally, we need adults in our schools, beyond the math teachers, who also talk about math in their content area classes. Teaching math is everyone's job. Let's remind one another as educators to adopt a "growth mindset" when it comes to math. Let's not say to our students, "Oh, I am NOT a math person," but instead show them ways that we use math in our various content areas and in real-world settings. As educators, we can model for our students that learning anything new is both rewarding and worth the effort. Let's encourage our students (and each other) to be open-minded about math, to find ways to make the math meaningful to our lives and to find ways to connect math to other core subjects and projects in the school and beyond.

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