

RESEARCH PROFESSIONAL PAPER

Making Effective Use of a Flexible
Blended Learning Model:
An Answer to Maximizing Educational
Outcomes for All Students





THE HMH RESEARCH MISSION STATEMENT

Houghton Mifflin Harcourt® (HMH®) is committed to developing innovative educational programs and professional services that are grounded in evidence and efficacy. We collaborate with school districts and third-party research organizations to conduct research that provides information to help improve educational outcomes for schools, teachers, and leaders at the classroom, school, and district levels. We believe strongly in a mixed-methods approach to our research, an approach that provides meaningful and contextualized information and results.

“My students are **DREAMING**, again, and they **ARE DOING THINGS** that so many people have told them that they can't do.”

— Sholanda Smith, *MATH 180* Teacher, Dysart USD

OVERVIEW

A Flexible Blended Learning Model + Universal Design for Learning Principles = SUCCESS FOR ALL STUDENTS

There is little doubt that modern learning technologies can have enormous benefits for a wide range of students, including students who struggle with sensory, attention, and language needs (Meyer & Rose, 2005). Researchers at the Center of Applied Special Technology (CAST) have been working to develop new universally designed learning techniques and technologies to personalize instruction for all students (Center for Applied Special Technology, 2017). Universal Design for Learning (UDL) is a research based framework that helps curriculum designers and teachers create learning environments that are inclusive and effective for all learners, including those with Autism Spectrum Disorder (ASD), as well as English learners (EL).

UDL was defined by the Higher Education Opportunity Act (2008) as a scientifically valid framework for guiding educational practice. UDL provides flexibility in the ways that information is presented, in the ways that students respond to information or demonstrate knowledge and skills, and in student engagement. UDL also reduces barriers in instruction, provides appropriate accommodations, supports and challenges students, and maintains high achievement expectations for all students.

Since all students are variable, UDL promotes the creation of flexible environments that provide students with a variety of options that allow them to reach their goals in multiple ways. UDL focuses on three distinct principles: Multiple Means of Representation; Multiple Means of Action and Expression; and Multiple Means of Engagement (Figure 1).

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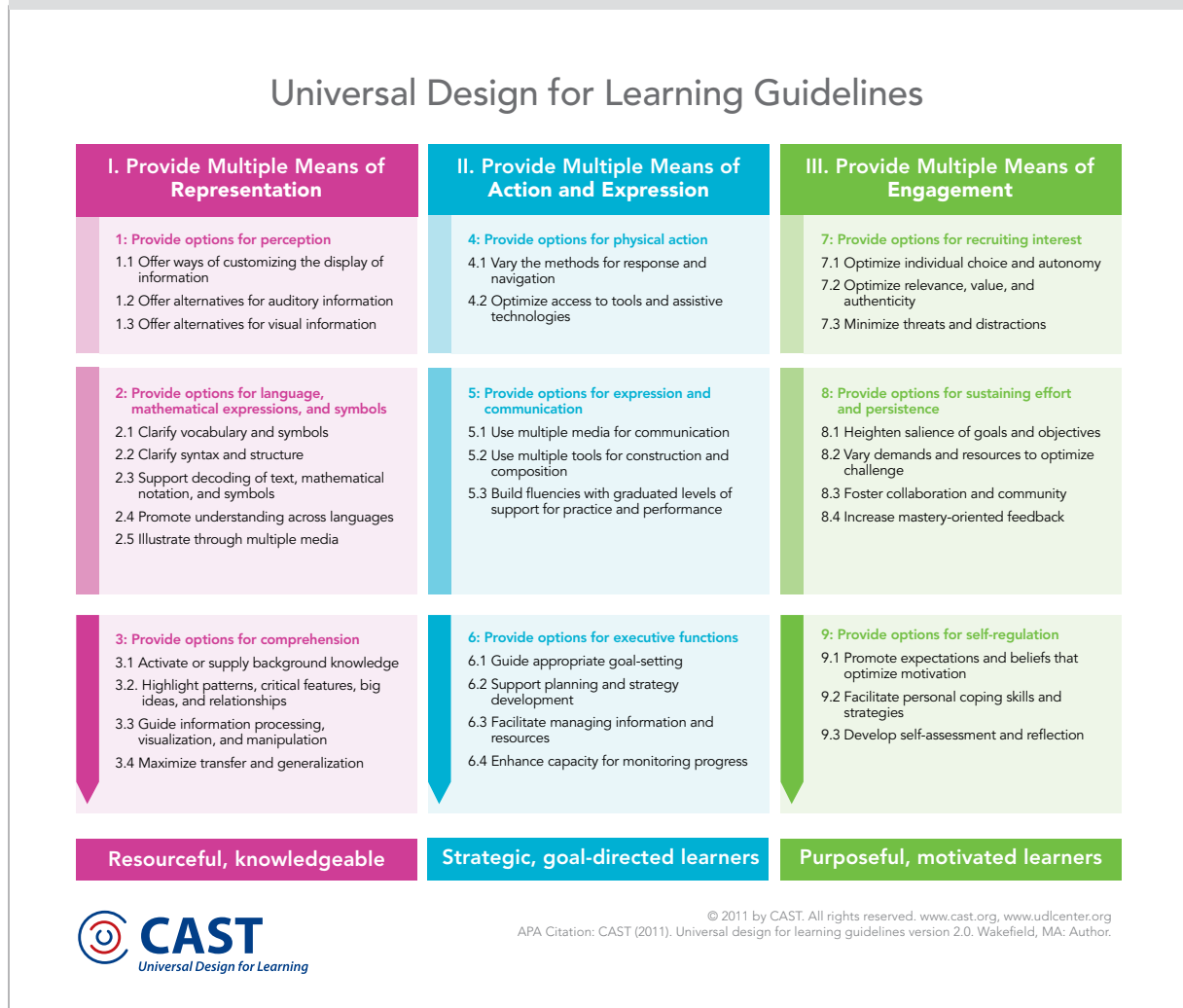
THE THREE DEVELOPMENTAL STRANDS OF *MATH 180*

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FIGURE 1. UNIVERSAL DESIGN FOR LEARNING GUIDELINES



“It’s like having **FUN** and **LEARNING** at the same time. — 7th Grader, Northern California District”

UDL PRINCIPLE I: MULTIPLE MEANS OF REPRESENTATION

Students perceive and comprehend information in highly individualized ways, with different strengths and weaknesses, so no one method of representation is going to serve the needs of all learners. Some students, especially ASD and EL students, face barriers because the representation of information assumes certain critical background knowledge, relevant vocabulary, and perceptual processing capabilities. Because there is such a wide range of individual differences among students, ensuring that all students have equal opportunities to learn requires providing options and alternatives.

UDL PRINCIPLE II: MULTIPLE MEANS OF ACTION AND EXPRESSION

Learning involves more than acquiring information. It is also a proactive, expressive endeavor of skills, strategies, organization, and communication. The way students approach learning tasks and express their understanding—the “how” of learning—differs dramatically from person to person. The UDL Guidelines recommend that educators provide learners with many options for both approaching learning tasks and expressing what they know.

UDL PRINCIPLE III: PROVIDE MULTIPLE MEANS OF ENGAGEMENT

What motivates someone to learn? What makes them persist even when tasks are hard or boring? How can they self-regulate their own learning, the way effective lifelong learners must? There are huge differences among learners in their answers to these questions. Information that does not engage ASD students’ cognitive abilities remains inaccessible—it goes unnoticed, unprocessed, and unremembered (Pellicano, 2010). Because ASD students differ significantly in what attracts or distracts their attention, it is vital that options make key information more salient and relevant and reduce threats of distraction. Many kinds of learning, particularly the learning of skills and strategies, require sustained attention and effort. To address disparities in initial motivation and susceptibility to competing attractions, it is essential to provide options that keep goals salient, provide the right challenge, and offer mastery-oriented feedback. For self-regulation, a successful approach requires providing sufficient options in order to support ASD learners with very different aptitudes and prior experience in managing their own engagement and affect. For EL students, a successful approach requires providing sufficient options in order to ensure that students are given the opportunity to comprehend the incoming information even when language barriers get in the way of understanding the instructional information.

MATH 180® supports the principles of UDL by providing a flexible blended learning model that meets the needs of all students. By giving students the opportunity to think metacognitively about how they learn, and by providing a platform that encourages them to love learning in their own unique way, *MATH 180* maximizes educational outcomes for all students (Figure 2).

FIGURE 2. INTEGRATION OF UDL PRINCIPLES IN MATH 180

MAKING LEARNING ACCESSIBLE

Universal Design for Learning principles are integrated throughout *MATH 180* to facilitate a mathematical growth mindset for all learners. Students consistently encounter math through multiple means of representation, including videos, print, audio recordings, animations, games, and interactive tools on the student software and whiteboard.



EMPOWERING SELF REGULATION

The *MATH 180* Dashboard provides scaffolded options to help students set goals for themselves, choose activities strategically, and monitor their own progress. *MATH 180* importantly offers support for setting explicit goals while monitoring and reflecting on progress toward those goals.

OPPORTUNITIES FOR STUDENT ENGAGEMENT

Anchor videos in *MATH 180* illustrate math in real stories and set an authentic theme. Students have many choices for engagement: the type of activities, the sequence of activities, the level of support, and difficulty. Areas such as the Explore Zone and Brain Arcade provide students with opportunities to show their learning while reducing various threats. The program emphasizes the value of learning from errors rather than from the stigma of failure.



THE THREE DEVELOPMENTAL STRANDS OF *MATH 180*

The three developmental strands behind *MATH 180* include a focus on what matters most (providing effective instruction), a force multiplier for teaching (providing program-based professional services), and attitude (developing a positive growth mindset). These goals were developed to transform math instruction so that struggling students, especially those with ASD and language challenges, believe in the possibility of success while simultaneously providing their teachers with the tools that they need to support all students in meeting the increasingly rigorous new standards for math.

STRAND 1: Effective Instruction Within a Flexible Blended Learning Model Makes a Difference

As was stated by Carol Weiss (1995), there is “nothing as practical as good theory.” This way of thinking has led scholars and educators to develop what is referred to as a theory of change. Within a theory of change, innovative people look for new and inspirational ideas of how to proliferate education. With a theory of change mentality, educational researchers have been investigating how the brain works to determine which educational practices are most effective in the classroom.

Findings from neuroscientific research are advancing the practical application of learning strategies for all students. Understanding that all students need quality instruction, and finding ways to individualize that instruction, builds confidence that even struggling students will succeed. The ability to learn is intricately intertwined with brain functioning (Carew & Magsamen, 2010). Incorporating evidence-based neuroscientific research into educational practice elevates students’ ability to learn. With a positive change in thinking about students as individuals who have unique ways of learning, realizing their strengths, and meeting their needs, a transformational educational journey can commence (Annie E. Casey Foundation, 2004).

For students with ASD, there is an interpersonal component that makes it very challenging to connect easily with teachers; however, with a flexible blended learning model, such as *MATH 180*, they excel (Scholastic Inc., 2013). Students on the spectrum have varying needs that are often best met when they are allowed to guide their own learning (Hasselbring, 2012). Flexible blended learning models that incorporate both teacher engagement and the use of adaptive technology provide ASD students with the support that they need to succeed (Claypool & McLaughlin, 2017). When technology is adaptive, it is capable of constantly assessing students as they learn. It is able to respond instantaneously to student progress and deliver instruction and practice at the optimal level.

Another aspect of technology-based instructional programs that greatly benefits students who struggle is its ability to readily provide targeted and repetitive practice. Like a musician who must repeatedly practice aspects of a new song until it becomes second nature, a student learning new skills needs the opportunity to practice them. This can be tricky in a crowded classroom full of students who need to practice different skills; however, smart, adaptive technology knows which skills each student is struggling with and provides the appropriate practice until it knows the student has mastered them (Hasselbring, 2012).

MATH 180 is designed to recognize that comprehending mathematical concepts while facing language barriers is an enormous hurdle. The research on effective instruction for ELs demonstrates the following principles (Goldenberg, 2013):

1. Generally effective practices, such as those that a flexible blended model allow, are likely to be effective with ELs, as well as the rest of the student body
2. English learners need plenty of opportunities to develop proficiency in English, which a personalized blended learning model can provide

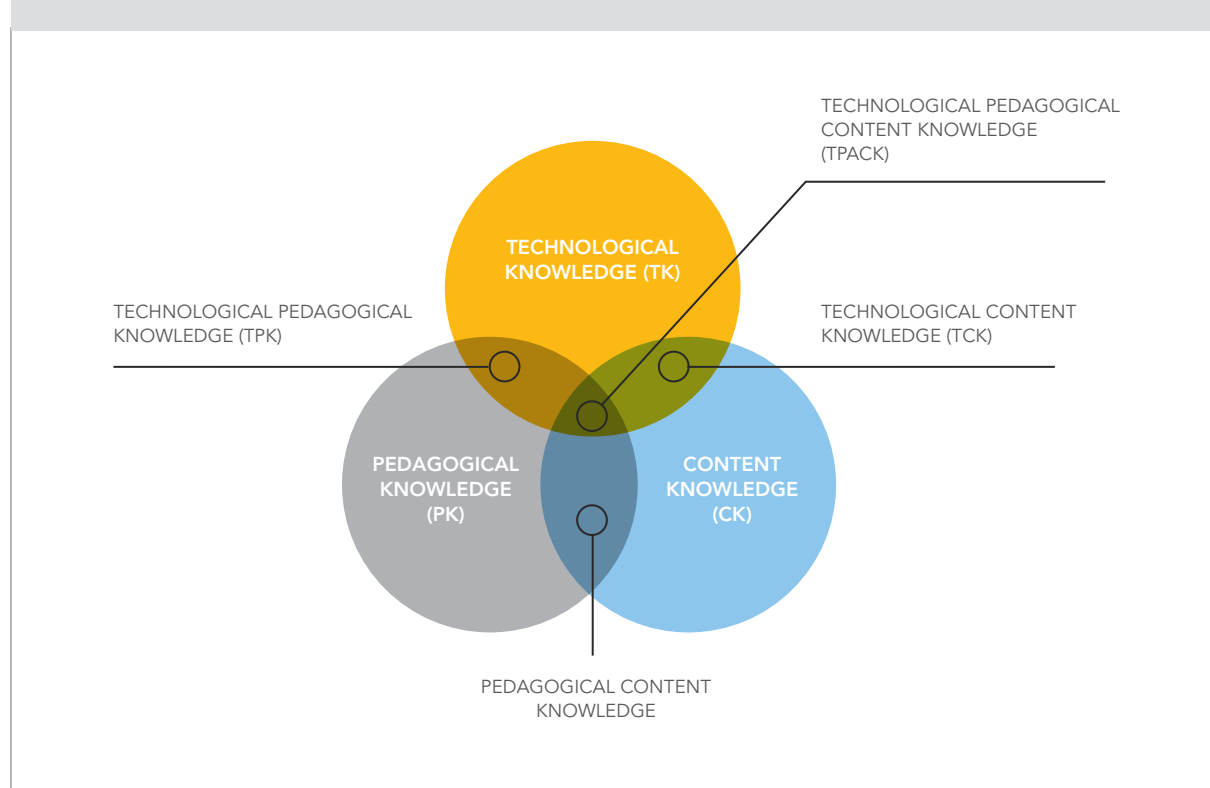
In a study of high-performing schools with large populations of ELs, four broad effective practices were identified as having the most significant positive correlation with high test scores (Williams, Hakuta, Haertel, et al., 2007):

1. Implementing a coherent, standards-based curriculum and instructional program
2. Prioritizing student achievement
3. Ensuring availability of instructional resources
4. Using assessment data to improve student achievement and instruction

2 STRAND 2: Program-Based Professional Services Improve Implementation and Student Achievement

When professional services are in place, a comprehensive learning environment is provided that can support not only the unique needs of a district or school, but also the needs of each unique classroom. The Technological Pedagogical and Content Knowledge (TPACK) framework supports three aspects that increase learning: content, pedagogy, and technology. These three aspects assist in successfully integrating technology into the classroom (Koehler, Mishra, & Cain, 2013).

FIGURE 3. THE TPACK FRAMEWORK AND ITS KNOWLEDGE COMPONENTS



Improving systems and achieving coherence across schools maintain a focus on deeper learning and pedagogy. The HMH Professional Services Group has identified three elements that deepen learning based on the work of Koehler, Mishra, & Cain (2013) and Fullan & Quinn (2016):

1. Providing systems that develop clarity of learning goals and build a shared understanding of the goals for students, educators, and parents
2. Building precision in pedagogy through development of a common language and knowledge base, identification of proven pedagogical practices, and demonstration of clear causal links to impact
3. Identifying processes that shift practice through capacity building such that leaders model best practices for their colleagues, shape a culture that fosters learning and innovation, and build capacity vertically and horizontally

Research has shown that teachers want to integrate more technology into their instruction (Bill & Melinda Gates Foundation, 2014). *MATH 180* Program-Based Professional Services support this need by focusing on instructional direction, as well as by building pedagogical and growth skills. The three areas of focus include:

1. Program-Based Services
2. Technical Services
3. Practice-Based Services

FIGURE 4. MATH 180 PROGRAM-BASED PROFESSIONAL SERVICES



PROGRAM-BASED SERVICES

The Program-Based Services team supports schools and districts in initiating and sustaining program implementation. This support can include [Professional Learning Courses](#), [Individual and Team Coaching](#), and [Collaboration Strategies](#) to ensure that teachers are building expertise with program content, strategies, and technology.

TECHNICAL SERVICES

The Technical Services team supports schools and districts with technical environment advice, [product support](#), [technical staff training](#), [installation](#), [reporting](#) and [data services](#), and web-based hosting to ensure fully functional school- and district-wide implementations.

PRACTICE-BASED SERVICES

The Practice-Based Services team, including [ICLE](#) and [Math Solutions®](#), supports schools and districts with best practices and innovative approaches to instruction, data, blended learning, and leadership. The team equips educators with effective, research-based strategies and supports a common language for learning and the culture for success.

STRAND 3: Utilizing the *MATH 180* Instructional Model Promotes a Positive Growth Mindset for All Students

Growth mindset is the belief that through effort and perseverance one can become better at whatever goal one is trying to achieve. The tendency to pursue long-term goals with sustained effort and hard work has been shown to predict academic achievement (Duckworth, Quinn, & Seligman, 2009; Duckworth & Quinn, 2009).

A student's growth mindset plays an important role in ensuring that a student is more engaged in learning, more resilient in the face of setbacks, and more academically successful (Dweck, 2007; Glej, 2013). Noncognitive factors, such as growth mindset, grit, and perseverance, influence student performance (Farrington, Roderick, Allensworth, Nagaoka, Keyes, Johnson, & Beechum, 2012). The report conducted by Farrington et al. defined four factors that constitute students' academic mindsets and lead them to persevere and display the behaviors associated with improved academic performance:

1. "I belong in this academic community" (sense of belonging)
2. "My ability and competences grow with my effort" (implicit theories of ability)
3. "I can succeed at this" (self-efficacy)
4. "This work has value for me" (expectancy-value theory)

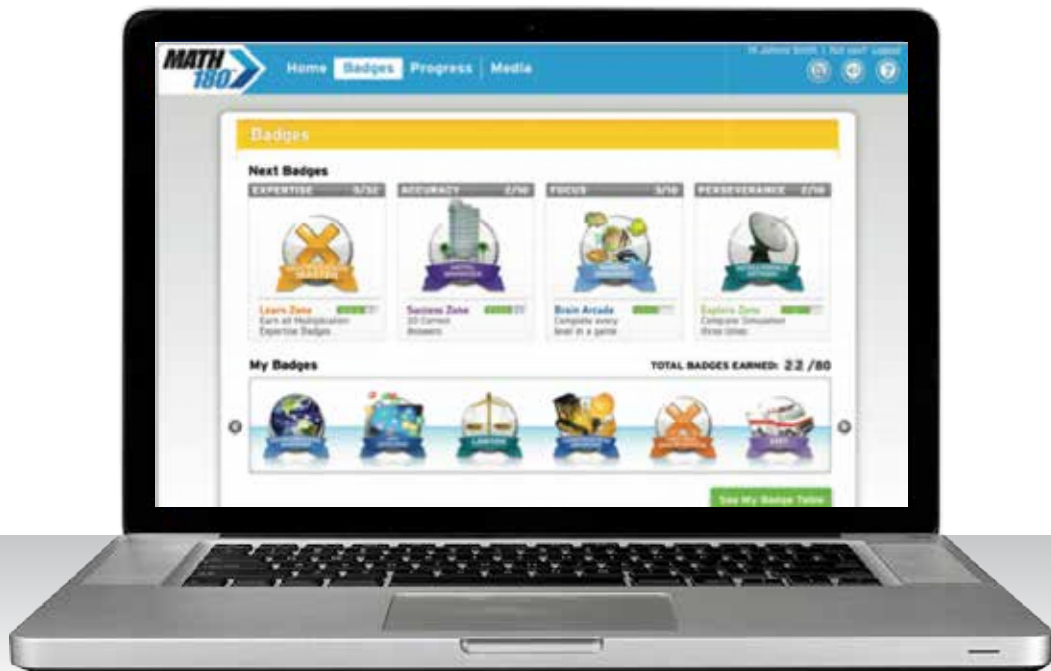
As stated by Dweck (2015), students' growth mindsets, in relation to how they perceive their abilities, have an impact on their motivation and achievement. In her 2015 study, Dweck found that a more positive growth mindset resulted in increased achievement. Students' growth mindsets, in relation to how they perceive their abilities, have an impact on their motivation and achievement. Students with a growth mindset, who believe that their intelligence is fluid as opposed to fixed, perform better. Dweck also found that students who believed that they could "grow their brains" performed better than those who did not. The results indicated that working hard and trying new strategies proliferate learning.

Effective instruction incorporates a flexible bended learning model that supports the development of a positive growth mindset. All students can progress in their mathematical journey, and supporting them with a program that encourages this belief within students and their teachers is especially important for students with unique struggles. In providing a program that promotes growth mindset, combined with experiences that demonstrate to students that their effort and persistence pay off, encourages their willingness to put forth the effort to grasp challenging math concepts.

As Figure 5 shows, the *MATH 180* program combines motivation and mindset with positive reinforcement in the Student Dashboard.

The Student Dashboard is a cohesive environment that enables students to make direct connections between their mindset, performance, and growth over time.

FIGURE 5. THE MATH 180 STUDENT DASHBOARD



A flexible blended learning model that allows for individualized instruction, as well as the provided program-based professional services, leads to success. Research evidence has shown that the flexible blended learning model provided by MATH 180 is particularly effective for ASD and EL students.

CLOSING

From researcher observations in the classroom and scores on progress monitoring measures, ASD and EL students who typically have difficulty responding to teachers have been seen to respond successfully to the *MATH 180* program. They excel as they move through the program with engagement and success. The personalization of the software allows them an opportunity to learn challenging math concepts in an individualized way while experiencing feelings of accomplishment. Additionally, the support provided by the HMH Professional Services Group, and the strengthening of a growth mindset that encourages children to understand that learning is a continual journey, creates an environment for mathematical success.

“With the **MATH 180** program, the students all have a sense of **URGENCY** to **LEARN**. These kids all **EMBRACE** coming to math every day, wanting to be **SUCCESSFUL**.

— Mr. Buccarelli, *MATH 180* Teacher”

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