mastery education

WHITE PAPER

Measuring Up

Research-Based Pedagogy

of the Digital Learning Online Program

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INTRODUCTION

According to a survey of schools conducted by the Center for Digital Education in conjunction with the National School Boards Association, the use of technology in U.S. school districts is rapidly increasing. By 2012, 85% of U.S. K–12 school districts surveyed offered at least one online class that was approved for credit, 75% of these school districts already have classroom technology in place, and 65% of these school districts have digital content strategy in place (Halpin & Muth, 2012). According to the International Association for K–12 Online Learning (iNACOL), 2 million students were taking at least one online course in 2012 (Patrick et al, 2012). Computers in the classroom are transforming the way that teachers and students engage with each other and with curriculum. As schools begin to innovate in the way in which they use technology, they must seek learning models that help achieve articulated learning goals and that work with technology synergistically.

In this white paper, we will address the following questions:

- What is digital learning?
- What does current research indicate about the impact of digital learning on student learning?
- What does robust digital learning look like? How can digital learning support what we know about how people learn?
- Where can digital learning happen and in what formats?
- How do *Measuring Up Insight* and *Measuring Up MyQuest* support schools that choose digital learning and blended learning models?

WHAT IS DIGITAL LEARNING?

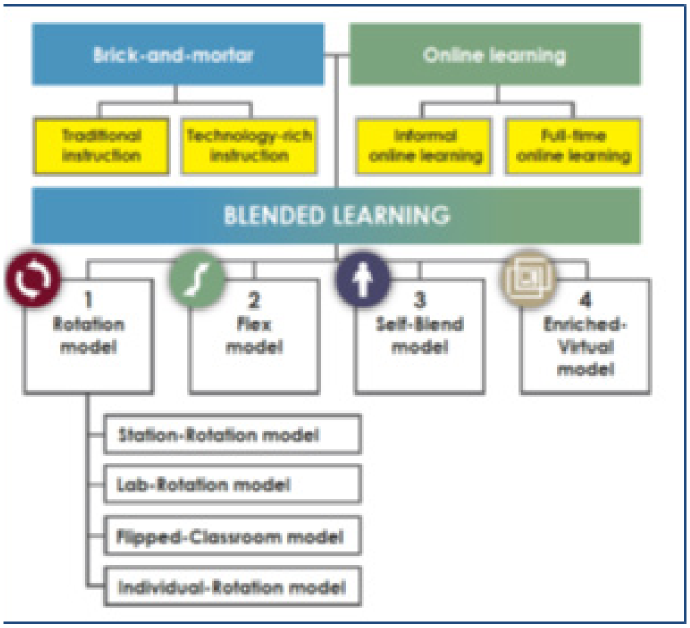
Although there is a growing body of research in the area of educational technology, educational researchers have not always uniformly agreed upon the definitions of *technology* and *educational technology.* Marzano and Magana in *Enhancing the Art & Science of Teaching with Technology* (2014) define *technology* as "electronic, digital, or multimedia tools used to achieve a goal more efficiently or effectively." In the same text, Marzano and Magana define *educational technology* as "the use of technology tools in the classroom to improve learning."

Educational technology is often referenced with regard to a predominantly teacher-centered classroom, for example through a technology-rich device such as a laptop/projector or Smartboard used to enrich a lesson. In contrast, in this paper, we will discuss how technology can be optimized in a student-centered learning environment in a variety of configurations *in and out* of the classroom. We will take a slightly broader look at educational technology in order to include the use of educational technology that may also occur outside the classroom, or outside the brick-and-mortar site (Staker, 2011) as described in *The Rise of K–12 Blended Learning.*

For the purposes of this white paper, we will use the term *digital learning* in order to include blended learning, learning management systems, online assessments, digital gradebooks, and education data systems (Staker, 2011). In the next section, we will discuss blended learning models in detail. Later we will take a look at one learning management system in particular—*Measuring Up* to the Common Core. Learning management systems are particularly useful as educational technology migrates beyond the classroom and follows students off-site where learning continues. These systems often include dashboards for gauging progress that have the potential to engage students in the formative assessment process and to foster motivation for skill mastery. Furthermore, learning management systems can assess each student's individual needs and tailor a learning pathway for that particular student. Finally, these systems can provide teachers with digital gradebooks and education data systems that help fine-tune instruction and assist teachers in making critical instructional decisions.

WHERE CAN DIGITAL LEARNING HAPPEN AND IN WHAT FORMATS?

Digital learning that is part of *a formal education program* and that occurs both in and out of the classroom qualifies as *blended learning* as long as *students… have some control over time, place, path, and/or pace* (Staker & Horn, 2012). A blended learning model may take any one of a variety of formats. Blended models extend along a continuum, some with significant teacher interaction at a brick-and-mortar site, and others with very little teacher interaction at a brick-and-mortar site. However, there is always some form of teacher support that can be accessed by students either online or at the brick-and-mortar site (Staker, 2011). In contrast, some courses/degrees are offered entirely online and students never visit a brick-and-mortar site; these are not considered blended learning experiences (Staker, 2011).



(Staker, 2011)

On one end of the continuum are the models that involve mostly "face-to-face" interactions with teachers in a traditional, teacher-centered setting (Staker, 2011). On the other end of the continuum are "mostly online" models with almost no student-teacher interaction in a very student-centered setting. Teachers might use digital learning in a teacher-centered classroom for remediation and supplemental instruction (for example for gathering scientific evidence from field work) in what Staker et al (2011) refer to as the *Face-to-Face Driver* model (not shown in the graphic above).

Next along this continuum (beginning at the far left in the graphic above) is the *Rotation Model,* frequently used in elementary school settings because it allows for a significant amount of student-teacher interaction (Staker, 2011). In this model students rotate among activities, including digital learning, on a fixed schedule at the teacher's discretion. A *Station Rotation* model occurs within a classroom where students rotate among a variety of stations (for example: some work with the teacher, some work in small groups, some work on individual assignments, and others work at the in-class computer station) (Staker & Horn, 2012). Some schools with limited technology in classrooms might opt for the *Lab-Rotation Model*—in this case, rotation is between at least two distinct locations in the brick-and-mortar campus where there is a designated digital learning lab (Staker & Horn, 2012). The *Flipped Classroom Model* is another form of the *Rotation Model* where digital delivery of content and instruction is done remotely (often at home after school) and homework is completed in school where students can get support from a teacher (Staker & Horn, 2012). In the *Flipped Model* students have control over time, place, path, and/or pace of how the course content is delivered (Staker & Horn, 2012). Finally, the *Individual-Rotation* model is implemented when students rotate on an individually customized, fixed schedule among learning modalities, one of which is online learning (Staker & Horn, 2012). In this form of blended learning an algorithm or teacher sets individual schedules based on individual needs allowing for flexibility in both the pathway and pace of instruction.

Moving from left to right along the continuum of blended learning is the *Flex Model* where content and instruction are delivered primarily digitally (often at schools with high-risk or non-traditional students); some flex models provide face-to-face support with on-site instructors, but this may be minimal (Staker & Horn, 2012). The *Flex Model* is more popular in middle school and high school settings where students can be more independent and less face-to-face interaction is necessary. However, the *Flex Model* can occur at the brick-and-mortar site so that younger students can access adult support as needed. If a *Flex Model* occurs entirely in a dedicated computer lab that is supervised, but not necessarily by teachers (often a paraprofessional), it may be referred to as an *Online Lab Model* (Staker & Horn, 2012). Sometimes the *Online Lab Model* is put into place when there are budgetary or resource shortfalls.

Next along the continuum is the *Self-Blend Model* or *A La Carte Model.* In this model students choose to take one or more courses entirely online to supplement traditional courses; these are popular in high schools for advanced courses beyond what is offered onsite or for credit-recovery. In this model the *teacher-of-record* is an online teacher; implementing a *Self-Blend Model* occurs on a student-by-student basis as opposed to as a whole-school or whole-grade experience (Staker & Horn, 2012). Often a school will put into place a policy that allows for a certain number of courses to be taken independently through a digital provider.

Finally, on the far right side of the *Blended Learning* continuum is the *Enriched-Virtual Model* or *Online Driver Model*—a whole-school experience (not course-by-course) where students divide time between a brick-and-mortar campus and learning remotely, digitally (Staker & Horn, 2012). In such a model, students rarely attend campus and, therefore, this almost never includes elementary-age students except in special circumstances. The *Enriched-Virtual Model* has become increasingly popular with non-traditional students and with students who have been unsuccessful in a traditional school setting.

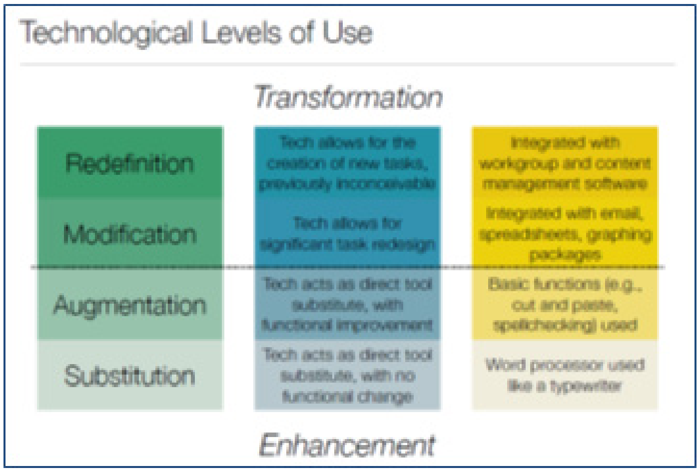
WHAT DOES ROBUST DIGITAL LEARNING LOOK LIKE? HOW CAN DIGITAL LEARNING SUPPORT WHAT WE KNOW ABOUT HOW PEOPLE LEARN?

Robust digital learning has the potential to leverage many of the essential ways in which we know that students learn best. We know from decades of educational research that our students learn best when the program in place is:

- differentiated in order to appeal to different learning styles;
- personalized in order to appeal interests;
- individualized and adaptive in order to capitalize on students strengths and weaknesses;
- problem-based and real life-based;
- engaging and student-centered.

Furthermore, we know that students need to meet rigorous standards in order to be prepared for college and career, and quality educational programs must be evidence-based and aligned to these standards. In order to create purposeful evidence in support of educational programming, ongoing formative assessments must be a transparent component of programming so that both students and teachers can monitor progress and create a purposeful path.

Quality digital learning has the potential to meet all of the parameters above if it is designed to be adaptive to individual student's needs and can go beyond the limitations of traditional, student-centered instruction that is confined to the classroom. According to Dr. Ruben Puentedura in "Transformation, Technology and Education" (2006), high quality digital learning should not simply augment or substitute instruction with no functional change but should modify or redefine tasks. Puentedura designed a set of rigorous metrics in order to evaluate technology as it is implemented. The SAMR continuum defines how technology can redefine education by allowing for the creation of new tasks, previously inconceivable, for example through the use of content management software or tools that allow for the visualization of narrative and structural aspects of text (Puentedura, 2006).



(Puentedura, 2006)

WHAT DOES CURRENT RESEARCH INDICATE ABOUT THE IMPACT OF DIGITAL LEARNING ON STUDENT LEARNING?

Early meta-analyses of computer-based instruction by Kulik (1994) provide support for the effectiveness of technology across many applications. In particular, given the fact that technology can give as much feedback as the student needs, on the student's time and at the student's pace, it stands to reason that computer-based instruction provides many students—including those who need more time and may learn more slowly—with special learning opportunities. Coley, Cradler, & Engel (1997) similarly found that "computer based instruction can individualize instruction and give instant feedback to students, even explaining the correct answer. The computer is infinitely patient and nonjudgmental, thus motivating students to continue."

In a more recent study of the effects of computerized technology on student learning and performance on assessments conducted by Martin, Klein & Sullivan (2007) the "[results] indicated that among the instructional elements, practice had the most impact on both learner achievement and attitudes. Participants who used one of the versions of the computer program that included practice… performed significantly better on the post-test than those who did not receive practice …" (Martin, 2006). In other words, computer-based practice that is aligned to standards, and designed in a similar format to the standardized tests that students will eventually take, provides students with effective learning opportunities and familiarity with question types and testing formats.

Even more recently, the U.S. Department of Education conducted its own meta-analysis and Magana and Marzano examined several meta-analyses of digital education practices, which include blended learning. Both the U.S.D.O.E and Magana and Marzano concluded that educational technology alone can produce slightly positive effects on student learning. However, in combination with effective instructional practices, the positive effects on student learning are greater than both technology in isolation or instructional strategies without technology in the classroom (U.S.D.O.E., 2010; Magana & Marzano, 2014). Furthermore, the U.S.D.O.E. report found that, "Online learning can be enhanced by giving learners control of their interactions with media and prompting learner reflection." Students who are engaged in monitoring their own progress and who make choices about the pace, the level of instruction, and the quantity of practice are at an even greater advantage than those in a traditional classroom setting.

HOW DO *MEASURING UP INSIGHT* AND *MEASURING UP MYQUEST* SUPPORT SCHOOLS THAT CHOOSE DIGITAL LEARNING AND BLENDED LEARNING MODELS

Measuring Up MyQuest and *Measuring Up Insight* meet the goals for transformative digital learning. *Measuring Up MyQuest* and *Measuring Up Insight* start the diagnostic process necessary for creating each student's Personalized Prescriptive Pathway—P3. Diagnostic practice tests, aligned either to PARCC or Smarter Balanced, are the launching off point for a genuinely prescriptive path that helps students to focus on the standards that they need to work on the most. Teachers have access to immediate results from all assessments and can quickly use them to inform instruction.

Measuring Up MyQuest is integrated seamlessly with *Measuring Up Insight*. The results from the Diagnostic Practice Tests are used to create each student's prescriptive pathway and to allow all learners individualized instruction at their own pace. Students can utilize the digital *Measuring Up MyQuest* instructional piece independently (with the implementation of a blended model, particularly with a *Flipped Model*), in small groups, or as a whole-class with teacher guidance. Once students are ready for the digital *Measuring Up MyQuest* practice component, they can continue to work independently, in small groups, or as a whole-class. In order to scaffold learning, the digital practice component includes cues for answer prompts and explanations for answers. Furthermore, the questions are provided in the format of standardized tests, thus allowing students opportunities to become familiar with both the standards-based content and the test format.

Within the practice component of *Measuring Up MyQuest* there are opportunities to personalize learning based on student interests and to engage in problem-based, real-world learning. *Elevate, Critical Thinking,* and *Kick-It Up!* tasks for both ELA and Math require that students apply the skills they've learned through open-ended tasks. In many of these tasks students are required to investigate, work with classmates, and construct complex responses. For example, in the following *Kick It Up* challenge, third grade students must apply their mastery of elapsed time to their everyday lives.

Kick It Up

Question 1: How can you describe your day using time?

Think of how often you use time each day. You use time to know when to get up, when school starts, when lunch begins, when school ends, and when to go to bed. Plus you use it for many other events during the day.

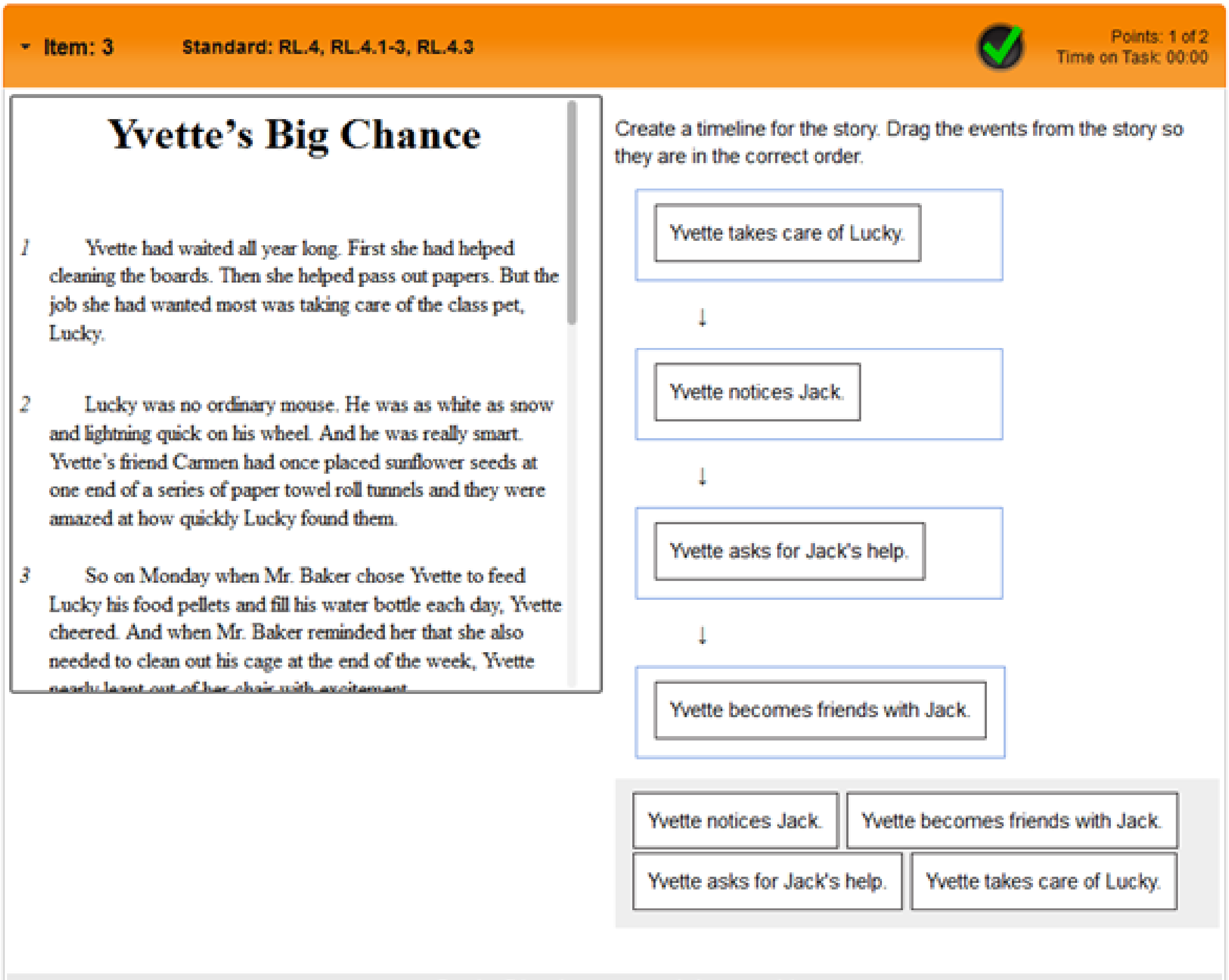
Work with a partner to describe your school day using time. You should discuss the daily activities and their start and end times. If your schedule varies from day to day, pick one day to use for the project. After you each finish writing the school schedule, work independently to write your own before- and after-school schedules. Keep going until you have included all the major events in your day from waking up to going to bed.

You can continue the activity by making a chart showing the times for all major events in your day for a week. Compare the days to find what events stay the same from day to day and what events change.

(*Measuring Up to the Common Core: Mathematics Level C,* 2013, p. 101)

For many learners, especially those who learn better with more individualized opportunities to self-pace and practice, the digital format of *Measuring Up MyQuest* and *Measuring Up Insight* is more reinforcing and more motivating than a paper-and-pencil version. Built-in rewards and incentives keep students engaged, excited, and motivated, and rigorous performance-based practice engages students at multiple cognitive levels. In addition, text-to-speech features provide support for ELLs and special needs students.

Technology-enhanced items in *Measuring Up Insight* also increase student engagement during assessments and create a transformative experience as compared to previous generations of assessments. Technology-enchanced items are computer-delivered items that require some kind of performance or specialized interaction in the "response" that is used for collecting data (Smarter Balanced Technology-Enhanced Items Guidelines, 2012). Interaction with the stimuli or answer choices can involve highlighting or selecting text, reordering text, dragging and dropping an object or text, or completing a sentence or equation using a drop-down menu or a fill-in constructed response. Recent research has shown that technology-enhanced items are an improvement over traditional selected-response items because they are more engaging and allow for students to use higher-level cognitive skills, process skills, and complex problem-solving skills (Huff and Sireci, 2001). In the grade 4 example below, students must rearrange the events from the story by placing the tiles in the correct sequence. There are 7 tiles and 4 possible timeline openings, allowing for 28 possible sequences and 1 correct sequence. The skills involved in this interaction include both lower cognitive functions (recalling details) and higher cognitive functions (ordering and showing content relationships).



(Measuring Up Insight®, *DPT for PARCC*, "4.EOY.1 English Language Arts Reading Test," 2014)

By using interactive, visual stimuli, less reading and less cognitive demand on working memory are required. Students can demonstrate skills (reasoning, synthesis, and evaluation) and knowledge without having to attend to "content irrelevant test-taking skills" because the test is not "imposing construct irrelevant high cognitive demands" (Clark & Mayer, 2011). As a result, TEIs can improve the measurability and effectiveness of the test item (Huff & Sireci, 2001). The visual nature of a TEI interaction space supports how students make meaning of the presented content (Kumar, White & Helgeson, 1993). Though research is limited in this area, there are significant implications for ELL students and special education students, in particular, who might otherwise be burdened by lengthy written instructions in the stimuli (Abedi, Lord, Hofstetter & Baker, 2000). In *Measuring Up Insight,* 20% of all items are now technology enhanced in order to simulate the same experience students will experience when taking a PARCC or Smarter Balanced assessment.

Finally, *Measuring Up* to the Common Core provides a learning management system with a dashboard for each student to assist in monitoring progress for both student and teacher.

CONCLUSION

All of the *Measuring Up* Core Success tools, including: *Measuring Up Insight*, *Measuring Up MyQuest*, and the Diagnostic Practice Tests for PARCC and Smarter Balanced, are a way of increasing the opportunities for standards-based diagnosis, learning, and practice for every student. Schools can choose to incorporate *Measuring Up* in a traditional classroom setting for supplemental instruction or in a non-traditional setting where blended learning and digital learning are the primary focus of content delivery, practice, and assessment.

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