mastery education

WHITE PAPER

Measuring Up

Research-Based Pedagogy

for *Measuring Up MyQuest®*

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INTRODUCTION

In June 2010, the Council of Chief State School Officers (CCSSO) and the National Governors Association (NGA) published the Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science & Technical Subjects and the Common Core State Standards for Mathematics. The CCSSO and NGA designed these new standards with the intent of better preparing students for both college and career. The standards themselves are based in research and evidence and are intended to be a "living work" that will evolve as new research and evidence emerges (Common Core State Standards, 2010).

Since its inception in 1990, Mastery Education (formerly Peoples Education) has built and revised student learning products based on continual review of scientific research literature. The foundation of Mastery Education's *Measuring Up MyQuest* program is a set of principles derived from the soundest current theory and research on literacy, language arts, writing, social studies, mathematics, science, differentiated instruction, and assessment. These principles are aligned with the research supporting the Common Core State Standards, and our instructional materials are aligned with the Common Core State Standards themselves. In addition, the *Measuring Up MyQuest* program continues to be aligned to the student learning standards of the state for which the materials are designed.

This document serves both to provide information about the *Measuring Up MyQuest* program and to explain the research on learning theory on which the system is based. Consequently, this document is organized in a way to be useful to educators who are considering the soundness and the practical uses of the materials in classrooms.

First, each principle underpinning the design of *Measuring Up MyQuest* is articulated. Second, a paragraph discussing the best-known and most respected educational research supporting the principle is given. Third, a discussion of the way *Measuring Up MyQuest* specifically embodies both the principle and its research-based foundation helps prospective educators see how the system can be used to help teachers collect information about their students' strengths and weaknesses and to help their students explore their own understandings of the standards-based information they are likely to encounter on the state test.

THE CHALLENGE

Today's educators, schools, and districts face a daunting challenge: how to raise student achievement in an increasingly rigorous, standards-based environment. This dilemma is particularly critical because the No Child Left Behind Act requires that:

- Each state adopts challenging academic content standards and challenging student academic achievement standards.
- Each state educational agency implements a set of high-quality, yearly student academic assessments that include, at a minimum, academic assessments in mathematics, reading or language arts, and science in order to be used as the primary means of determining the yearly performance of children and of discerning whether they meet the state's challenging academic standards (No Child Left Behind [NCLB], 2002).

For those states that have adopted the Common Core State Standards, the newly aligned assessments will require greater depth of learning and critical thinking skills than the assessments of the past. In addition to the increased rigor, the new assessments will also be administered via computer.

THE *MEASURING UP MYQUEST* PROGRAM

Measuring Up Core Success is a supplemental assessment and instructional program with lessons completely aligned to the Common Core State Standards and, for those states in transition or those that are not adopting the new standards, customized to that state's curriculum standards.

Measuring Up MyQuest provides ongoing practice and skill-building content delivered online via a student-based user experience. Students move through an intuitive strand/skills-based interface that provides both navigation and progress reporting in a single view. The strands and skills were created from

the standards, offering short tests in traditional or game modes. As students move through the program, the cueing system provides answer prompts to enable meaningful independent practice. Furthermore, because *Measuring Up MyQuest* is designed to be self-paced and tasks either scale up or down, depending on students' strengths or weaknesses, the program is ideal for supporting differentiated instruction.

RESEARCH-BASED PEDAGOGY OF THE *MEASURING UP MYQUEST* PROGRAM

Measuring Up MyQuest is fully aligned to the Common Core State Standards and continues to support and enhance best practices for effective teaching of each state's mandated curriculum and performance objectives, particularly for those states that are in a period of transition to the new standards. The research-based, unifying pedagogical principles outlined below are common across state standards and the Common Core State Standards and form the foundation of the *Measuring Up* program's design. The principles listed on the following pages apply to the *Measuring Up MyQuest* component of the complete *Measuring Up* program.

RESEARCH PRINCIPLE 1
CHALLENGING STANDARDS

Educational programs must be based on challenging academic content standards in academic subjects, the teaching of advanced skills, and challenging student academic achievement standards (NCLB, 2002).

RESEARCH BASIS FOR PRINCIPLE 1: The most extensive and best-known research about the effects of expectations is addressed by Rhona S. Weinstein (2002) in her book, *Reaching Higher: The Power of Expectations in Schooling,* a landmark in support of the results that high standards and expectations can produce. Weinstein's book argues as its thesis that "If . . . we are interested in the development of all children, we must link higher standards to effective teaching strategies for diverse learners. Our assessments of achievement must inform the next steps of instruction, rather than simply hold children accountable for what they may not have been taught." Weinstein's argument lays the foundation for continual formative assessment as well as differentiated instruction based on the results of that assessment.

RESEARCH PRINCIPLE 1 APPLIED: The implication of Weinstein's statement is that assessment must help teachers understand what students know and need to know. The *Measuring Up* materials can be used with students to help teachers know in advance of instruction where gaps in their students' understandings lie. Teachers can then begin to think about filling in those gaps for all learners. The standards demand high achievement for all, and *Measuring Up MyQuest* can be seen first as an aid to student learning toward those goals and second as a step toward positive assessment results. *Measuring Up MyQuest* can be used with all students of all abilities. It supports formative assessment in order to determine where students need help in approaching the standards, and it supports quality differentiated instruction practices so that all students can make the necessary progress at their own pace. In other words, using the program allows teachers to enact the principle that high standards can result in higher achievement for all students by using the assessment materials to inform the next steps of instruction.

RESEARCH PRINCIPLE 2
FORMATIVE ASSESSMENT

Formative assessments occur throughout a unit of instruction. Because they occur more frequently, and because their purpose is to inform further instruction, students receive more immediate feedback on their learning. "Formative assessments . . . are essential. They permit the teacher to grasp the students' preconceptions, understand where the students are in the 'developmental corridor' from informal to formal thinking, and design instruction accordingly" (Bransford et al., 2000). Formative assessments "might be one of the more powerful weapons in a teacher's arsenal" (Marzano, 2007).

RESEARCH BASIS FOR PRINCIPLE 2: In a seminal meta-analysis of research on formative assessment practices, Black & Wiliam (1998) concluded that there were critical gains in student achievement in classrooms where formative assessment was used to help inform instruction. Furthermore, they found that gains were particularly considerable for low-achieving students. Since this landmark body of research, much has been written about the benefits of formative assessment and its potential for benefiting learning. Oberdorf & Taylor-Cox (2012) write that "formative assessment allows teachers to provide the specific instruction

that each student needs. The more we know about students' levels of understanding, the more effective and targeted our instruction can be. Routine use of formative assessment enables teachers as they navigate instruction driven toward individual student success." In addition, "Teachers' regular use of formative assessment improves their students' learning, especially if teachers have additional guidance on using the assessment to design and individualize instruction" (The National Mathematics Advisory Panel, 2008).

The CCSSO (2008) describes the primary purpose of formative assessment as a process: "to provide evidence that is used by teachers and students to inform instruction and learning during the teaching/learning process. Effective formative assessment involves collecting evidence about how student learning is progressing during the course of instruction so that necessary instructional adjustments can be made to close the gap between students' current understanding and the desired goals." Once teachers identify individual student needs, they have the requisite information to initiate the process of individualizing, or differentiating, instruction (Stiggins, 2005). "It's worth stressing that because the formative assessment process deals with ongoing instruction, any teacher-made modifications in instructional activities must focus on students' mastery of the curricular aims currently being pursued" (Popham, 2008). This assumption is in direct opposition to moving on and choosing a different approach next time (Popham, 2008).

Finally, students too can take greater ownership of their own learning with the use of effective formative assessments and clear communication between teacher and student (Stiggins, 2005). "As teachers help students track their progress, students can tell exactly where they are. A student who knows he's far from meeting a target will realize that he needs additional practice or more scaffolding. And a student who meets a target quickly can tell that she's ready for an additional challenge" (Dobbertin, 2012).

RESEARCH PRINCIPLE 2 APPLIED: Together, teacher observation and *Measuring Up MyQuest* enable teachers to define and implement a P3—Personal Prescriptive Path of instruction for all students, no matter how diverse they are as learners. In addition, students' approaches and solutions to questions provide teachers with extra information about what their students know and how they think. The *Measuring Up MyQuest* program is designed to provide diagnostic information for teachers about their students. *Measuring Up MyQuest* includes optional pre- and post-instruction assessments to determine students' initial areas of weakness and to measure overall effectiveness.

RESEARCH PRINCIPLE 3
DIFFERENTIATED INSTRUCTION

Once teachers have ascertained their students' individual strengths and weaknesses through formative assessments, a differentiated approach for each student is the most effective path to mastery of concepts and acquisition of understandings. "The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is and assisting in the learning process" (Hall et al., 2011).

RESEARCH BASIS FOR PRINCIPLE 3: There is a significant amount of research to support that students are more successful when they are taught to their individual levels of readiness. The foundation for this research begins with Vygotsky (1978) and his theory on the Zone of Proximal Development (ZPD), the range at which learning takes place. Fisher (1980, in Tomlinson & Allan, 2000) and other researchers have found that students tend to learn best, and feel best about their learning experience, when they are at about 80% accuracy with the material. In order to achieve this level of accuracy, many researchers have found that students need to be grouped flexibly and instruction should be focused on broad concepts so that students can learn at varying degrees of complexity within that concept (Hall et al., 2011).

Even with the heavy emphasis on mastery of standards, differentiation can be achieved to meet the needs of our students. "Under the right conditions, personalized instruction and a standards-based curriculum can complement each other rather than exist at odds" (Powell & Kusuma-Powell, 2012).

RESEARCH PRINCIPLE 3 APPLIED: *Measuring Up MyQuest* provides a standards-aligned tool that teachers can use to differentiate their students' learning experiences. Students can work on particular skill sets or content areas where they need the most support or where they are ready to meet new challenges. Working within each student's zone of proximal development is continually reinforced by the program's self-leveling feature. *Measuring Up MyQuest* automatically adjusts the grade level

and difficulty of content (scaling up or down) based on students' performance. Furthermore, teachers can use *Measuring Up MyQuest* to model how different students arrive at the same answer through different means and pathways.

RESEARCH PRINCIPLE 4
MEANINGFUL INDEPENDENT PRACTICE

When students receive immediate feedback, as a result of a formative assessment, they are able to take ownership of their learning experience and engage in meaningful independent practice. Practice involves some degree of repetition so that "practice does not make perfect, practice makes permanent" (Sousa, 2006). This is particularly true for the goal of turning procedural knowledge (performing long division or sounding out an unknown word while reading) into fluency that allows for engaging in academic practices (such as computation and reading) with greater ease (Marzano, 2007). Especially with the goal of fluency in mind, students need the opportunity to engage with procedures independently and at their own pace (Marzano, 2007).

RESEARCH BASIS FOR PRINCIPLE 4: In order to create meaningful independent practice opportunities, students need motivation to engage with the material purposefully. According to Sousa (2009), "Four key factors affect the intensity of a learner's intrinsic motivation in any given situation: emotions, feedback, past experiences, and meaning. These factors are all connected and influence one another to some degree." Feedback, in particular, is critical in setting the stage for a motivated, independent learning experience. "Recent imaging studies have shown that brain regions associated with motivation are more active in subjects who are learning tasks and receiving feedback than in subjects doing the same tasks with no feedback (van Duijvenvoorde et al., 2008, Sousa, 2009). However, feedback must be timely, frequent, specific, and impersonal from the students' perspective in order for it to have a positive impact (Sousa, 2009, Marzano, 2007, Brookhart, 2008). In a meta-analysis of studies of feedback, Kluger and DeNisi (1996) found that the average effect of feedback intervention on performance was .41, depending on the nature of the feedback (positive, negative, related to the task, related to the process, etc.) (Brookhart, 2008). "Good feedback gives students information they need so they can understand where they are in their learning and what to do next—the cognitive factor" (Brookhart, 2008).

Once the critical motivation is established through constructive feedback, opportunities to practice a procedural skill are essential in order to create long-term cognitive memory and fluency (Sousa, 2006). "For procedural skill to develop, it must be practiced" (Marzano, 2007). Practice should first begin under the guidance of the teacher and then take place independently; this kind of guided practice is proven to be effective for improving performance (Marzano, 2007). Independent practice, either in the classroom or as homework, further establishes procedural knowledge and develops fluency.

RESEARCH PRINCIPLE 4 APPLIED: *Measuring Up MyQuest* provides students and teachers with timely, specific feedback through detailed progress reports that encourage independent student motivation. And, *Measuring Up MyQuest* supports practice in skill and strand areas so that long-term cognitive memory and fluency can be developed. Teachers can use *Measuring Up MyQuest* with frequency because of the variety and large bank of tasks for each skill area and because the program allows for either increasing or decreasing the level of difficulty depending on each student's needs. Finally, *Measuring Up MyQuest* supports meaningful independent practice through the system's cueing of answer prompts, which allow students to reflect on their progress and assess their own errors.

RESEARCH PRINCIPLE 5
COMPUTERIZED TECHNOLOGY

Computerized technology, particularly when used to prepare for standardized testing, promotes individualized learning and supports differentiated instruction in the classroom.

RESEARCH BASIS FOR PRINCIPLE 5: 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) also found that "studies show 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 conducted by Martin, Klein & Sullivan (2007), "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, Klein & Sullivan, 2007). 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.

RESEARCH PRINCIPLE 5 APPLIED: *Measuring Up MyQuest* allows all learners individualized instruction at their own pace, including cues for answer prompts and explanations for answers to practice items. The questions are provided in the format of standardized tests, thus allowing students opportunities to become familiar with both standards-based content and test format. For many learners, especially those who learn better with more individualized opportunities to self-pace and practice, the online format is both more reinforcing and more motivating than a paper-and-pencil version would be. *Measuring Up MyQuest* is a way of increasing the opportunities for standards-based learning and practice for every student.

RESEARCH PRINCIPLE 6
TEST PREPARATION

Teachers are responsible for teaching the skills, knowledge, and behaviors essential to answering test questions, as well as for preparing their pupils for the formal assessments. Students too can be an essential factor in successful test preparation when given the tools and information to improve their performance.

RESEARCH BASIS FOR PRINCIPLE 6: There is considerable research about how much and what kind of test preparation is valuable. In one of the earlier studies, Becker (1990) conducted an extensive meta-analysis of the research on test preparation and concluded that on average, helping students understand how to approach test questions can help increase test scores. In a landmark meta-analysis of the National Education Longitudinal Study (NELS) database, Briggs (2001) concluded that, after rigorous coursework, the next most significant impact on test scores is the use of quality test-preparation materials that familiarize students with the test and the knowledge base they need to answer the questions. Briggs also noted that students who had taken a high-stakes test previously were most likely to improve their scores after interaction with test prep materials.

Other researchers have noted similar results, including Gulek (2003), who writes that adequate and appropriate test preparation plays an important role in helping students demonstrate their knowledge and skills in high-stakes testing situations. Sloane & Kelly (2003) write that: "Students can be effective instruments in their own learning if the teacher is clear on the learning goals and the students are informed of their current performance and given clear steps for remediation. . . . The task for teachers is to know and understand their state's standards, and then translate this knowledge to continuously help students learn and self-assess to meet those standards."

It is critical that students' ownership of their progress is an integral part of the test preparation process.

RESEARCH PRINCIPLE 6 APPLIED: *Measuring Up* Core Success provides assessment activities embedded in the system to provide practice in applying curriculum standards in the format of standardized tests. Each strand and skill in *Measuring Up MyQuest* is linked to the Common Core State Standards and to the remaining state standards. And, because students and teachers receive immediate feedback through detailed progress reports, the program facilitates targeted instruction and meaningful independent work. As part of the program, teachers can use *Measuring Up Insight* to help individual students strengthen their skills and knowledge within the standards and experience test questions that resemble those on standardized tests. Moreover, a bank of *Measuring Up* to the Common Core Diagnostic Practice Tests for both the PARCC and Smarter Balanced assessment consortia provide additional ways to ensure that students are fully prepared for the rigors of the next generation of standards-based assessment. Each practice test incorporates blueprint test design to reflect released sample items.

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