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EFFICACY

Measuring Up

Measuring Up Insight® Demonstrates Efficacy for Measuring Seventh- and Eighth-Grade Students' Gains in Mathematics

Research

Measuring Up Insight *Demonstrates Efficacy for Measuring Seventh- and Eighth-Grade Students' Gains in Mathematics*

DISTRICT CHARACTERISTICS

A New Jersey PreK-12 school district with approximately 4,900 students enrolled in the 2015-2016 school year was analyzed. The majority of students in the district were Caucasian (60%). In addition, there were students from minority backgrounds including African American (36%), Hispanic (1%), Asian/Pacific Islander, American Indian, and students of mixed race (<1%). One percent of students had an Individualized Education Program (IEP), and less than 1% of students were English Language Learners (ELLs).

SCHOOL CHARACTERISTICS

A district middle school with a total of 831 students enrolled across 7th- and 8th-grades. The majority of students were African American (61%). In addition, students were Caucasian (25%), Hispanic (11%), Asian/Pacific Islander (3%), and mixed race (<1%). There was a roughly equal distribution of girls (49%) and boy (51%). Fifty-nine percent of students were eligible for free or reduced-price lunch.

PARTICIPANTS

A total of 317 students in 7th-grade and 290 students in 8th-grade participated.

Students included in the study met the following criteria:

1. Completed the September 2015 district-wide administration of the *Measuring Up Insight* Math assessment
2. Completed the April 2016 district-wide administration of the *Measuring Up Insight* Math assessment
3. Participated in *Measuring Up MyQuest*® instructional practice throughout the school year

IMPLEMENTATION OVERVIEW

In the 2015-2016 school year, students utilized the *Measuring Up MyQuest* digital program as a supplement to their usual curriculum. *Measuring Up MyQuest* is an adaptive learning tool that provides a personalized learning experience for students to practice the Common Core State Standards-aligned skills needed to be successful on the PARCC. *Measuring Up MyQuest* delivers corrective feedback as a scaffold for student learning and a reward system that provides positive reinforcement to encourage student engagement. Students were empowered to work independently, completing math skills practice lessons tailor-made to meet their individual needs throughout the school year.

MEASURES

In September 2015 and April 2016, there was a district-wide administration of the *Measuring Up Insight* assessment. *Measuring Up Insight* is an online formative assessment tool with customizable, technology-enhanced items that follow the form and function outlined by PARCC. *Measuring Up Insight* also provides teachers and administrators with actionable reporting capabilities to inform individualization of instruction to meet students' needs. Performance on the assessments is reported as scale scores ranging from 1 to 44 (7th grade) and 1 to 42 (8th grade).

COMMON CORE MATH STANDARDS

The practice and assessment items examined in this study delivered through *Measuring Up MyQuest* and *Measuring Up Insight* were aligned to the following standards:

7TH GRADE STANDARDS

CCSS.MATH.CONTENT.7.EE.A.1
Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

CCSS.MATH.CONTENT.7.EE.A.2
Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

CCSS.MATH.CONTENT.7.EE.B.3
Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

CCSS.MATH.CONTENT.7.EE.B.4.A
Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

CCSS.MATH.CONTENT.7.EE.B.4.B
Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

CCSS.MATH.CONTENT.7.G.A.1
Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

CCSS.MATH.CONTENT.7.G.B.4
Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

CCSS.MATH.CONTENT.7.G.B.5
Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

CCSS.MATH.CONTENT.7.G.B.6
Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

CCSS.MATH.CONTENT.7.NS.A.1.B
Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.A
Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.B
Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then -(p/q) = (-p)/q = p/(-q). Interpret quotients of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.C
Apply properties of operations as strategies to multiply and divide rational numbers.

CCSS.MATH.CONTENT.7.NS.A.2.D
Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

CCSS.MATH.CONTENT.7.NS.A.3
Solve real-world and mathematical problems involving the four operations with rational numbers.

CCSS.MATH.CONTENT.7.RP.A.1
Compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.

CCSS.MATH.CONTENT.7.RP.A.2.A
Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

CCSS.MATH.CONTENT.7.RP.A.2.B
Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

CCSS.MATH.CONTENT.7.RP.A.2.C
Represent proportional relationships by equations.

CCSS.MATH.CONTENT.7.RP.A.3
Use proportional relationships to solve multistep ratio and percent problems.

CCSS.MATH.CONTENT.7.SP.A.1
Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

CCSS.MATH.CONTENT.7.SP.B.4
Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

CCSS.MATH.CONTENT.7.SP.C.8.A
Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

CCSS.MATH.CONTENT.7.SP.C.8.B
Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g."rolling double sixes"), identify the outcomes in the sample space, which compose the event.

8TH GRADE STANDARDS

CCSS.MATH.CONTENT.8.EE.A.1
Know and apply the properties of integer exponents to generate equivalent numerical expressions.

CCSS.MATH.CONTENT.8.EE.A.2
Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

CCSS.MATH.CONTENT.8.EE.A.3
Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

CCSS.MATH.CONTENT.8.EE.A.4
Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

CCSS.MATH.CONTENT.8.EE.B.5
Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

CCSS.MATH.CONTENT.8.EE.C.7.B
Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

CCSS.MATH.CONTENT.8.EE.C.8.B
Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.

CCSS.MATH.CONTENT.8.F.A.1
Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

CCSS.MATH.CONTENT.8.F.A.3
Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

CCSS.MATH.CONTENT.8.F.B.4
Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

CCSS.MATH.CONTENT.8.F.B.5
Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

CCSS.MATH.CONTENT.8.G.A.2
Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

CCSS.MATH.CONTENT.8.G.A.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

CCSS.MATH.CONTENT.8.G.A.4
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

CCSS.MATH.CONTENT.8.G.A.5
Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

CCSS.MATH.CONTENT.8.G.B.7
Apply the Pythagorean theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

CCSS.MATH.CONTENT.8.G.C.9
Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

CCSS.MATH.CONTENT.8.NS.A.1
Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion, which repeats eventually into a rational number.

CCSS.MATH.CONTENT.8.NS.A.2
Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).

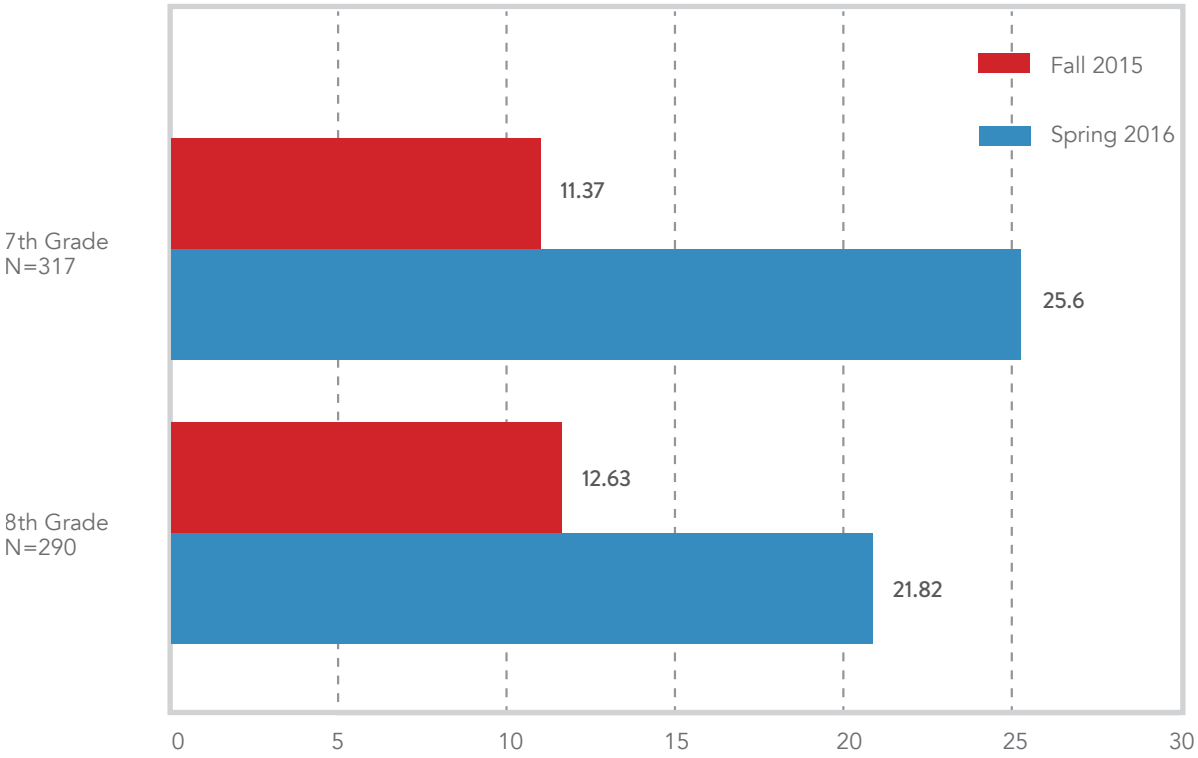
CCSS.MATH.CONTENT.8.SP.A.1
Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

CCSS.MATH.CONTENT.8.SP.A.2
Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

RESULTS

Findings reveal that both 7th- and 8th-grade students demonstrated statistically significant gains ($p < .05$) in math skills on the *Measuring Up Insight* test from fall 2015 to spring 2016. Average gains for 7th-grade students were 14.23 points (see Graph 1), while average gains for 8th-grade students were 9.19 points (see Graph 2). Strong reliability scores were found on the *Measuring Up Insight* tests for both 7th- and 8th-grade students. Reliability statistics for the 7th-grade pretest and post-test were $a = .82$ and $a = .88$ respectively. Reliability statistics for the 8th-grade pretest and post-test were $a = .76$ and $a = .83$ respectively. Findings indicate that 7th-grade students spent on average 60.85 minutes per standard of practice time in *Measuring Up MyQuest*, while 8th-grade students spent on average 165.20 minutes per standard of practice time. Practice time is reported as the average time in minutes spent per standard over the course of the school year. There was a statistically significant ($p < .01$) correlation between 8th-grade students' spring 2016 post-test and their practice time in *Measuring Up MyQuest*. In addition, the correlation between 7th-grade students' gains and practice time in *Measuring Up MyQuest* was approaching significance.

MEASURING UP INSIGHT MATH SCORES



CONCLUSION

Results from these school-year gains analyses illustrate that 7th- and 8th-grade students made significant improvement in their mathematics achievement from fall 2015 to spring 2016 as measured by *Measuring Up Insight*. *Measuring Up Insight* has been proven to be an effective and reliable tool for longitudinal assessment of Common Core State Standards-aligned math skills of 7th- and 8th-grade students. Correlational analyses illustrate a significant relationship between *Measuring Up MyQuest* usage and math outcomes, such that the greater amount of practice time 8th-grade students spent using *Measuring Up MyQuest*, the higher their spring 2016 post-test scores became. In conclusion, this study demonstrates that *Measuring Up Insight* is an effective tool for measuring students' mathematics achievement, and *Measuring Up MyQuest* is an effective program for increasing students' mathematics achievement.

REFERENCE

Common Core State Standards Initiative. (2016). Retrieved from http://www.corestandards.org/ELA-Literacy/

At Mastery Education, we understand both the profound importance and the practical challenges of nurturing 21st-century skills in the classroom. To improve students' skills, knowledge, and readiness for assessment, our research-based products provide rigorous content and scaffolded support, real-world applications and problem-based learning, formative assessment and plenty of practice. Like you, we are constantly striving to deliver opportunities that provide richer and deeper learning experiences and that prepare students for the challenges of mastering today's standards and unlocking all the possibilities of a brilliant future.

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