Product Research

TEKS-BASED ASSESSMENTS MATH

Supporting documentation for the development of
TEKS-Based Math Assessments

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TEKS-Based Math Assessments

The development of current state standards for K–12 Mathematics was adopted by the State Board of Education in 2012 for Texas schools to be implemented in grades K–8 in the 2014–2015 school year and in grades 9–12 in the 2015–2016 school year. Texas Essential Knowledge and Skills (TEKS) for Mathematics identify what students should know and be able to do at every grade. More specifically, the Mathematics TEKS measure student proficiency in the acquisition of knowledge and skills covered by the curriculum at the specified grade level. Students should not be compared to each other but rather evaluated on how well they are individually meeting grade-level standards. These standards provide a consistent framework to prepare all students for success in the K–12 educational years and as they advance to college and careers. Texas measures how well students are progressing in mathematics with the statewide assessment, the State of Texas Assessments of Academic Readiness (STAAR™).

The most recent STAAR™ assessments earmark a significant change in the State of Texas assessment system. According to the Texas Education Agency (TEA), assessments will contain rigor beyond what has appeared in past state assessments. The rigor of items "will be increased by assessing skills at a greater depth and level of cognitive complexity" (TEA, 2010d). Another new element to the STAAR assessment is the requirement of a four-hour time limit for each mathematics assessment. Researchers indicate the importance of a balanced approach to assessments (Black, Harrison, Lee, Marshall, and Wiliam, 2003; Garrison and Ehringhaus, 2007). This approach focuses on summative assessments, benchmark or interim assessments, and formative assessments. A comprehensive system is a balanced approach, with all assessments having a relatedness intended to improve achievement. TEKS-Based Math Assessments are summative assessments that measure student progress in mathematics at two different points during the year.

The Every Student Succeeds Act (ESSA) requires that academic assessments for "math and reading or language arts must be administered annually in grades 3–8 and at least once in grades 9–12…" (Mandlawitz, 2016, p.1). The critical issue of accountability will continue with ESSA, but assessments will be used to help improve schools and inform instruction. The law allows the state and local levels the opportunity to create systems for accountability, resources, interventions and teacher evaluation systems. The federal requirements of ESSA and the Individuals with Dis- abilities Education Act (IDEA, 2004) mandate that all students participate in the state assessment program. All students must be tested in reading content at their respective grade levels.

Due to past and present accountability issues, assessment practice is essential to meeting standard mastery. Summative, benchmark, and formative assessments are necessary, developing an accurate picture of a student's overall academic achievement. Herman, Osmundson, and Dietel (2010) attested to benchmark assessments occupying a space in the middle yet play an important role in a balanced assessment system. The National Research Council recognized a comprehensive assessment system as one that is coherent, comprehensive, and continuous (NRC, 2001). Classroom benchmark assessments correlated to the TEKS provide teachers ongoing interval measurements of student progress; thus, the rationale for TEKS-Based Math Assessments for Levels 1–8.

These assessments are designed to measure student acquisition of the knowledge and skills specified in the Texas Essential Knowledge and Skills at different intervals. Herman (2009) noted that there are teachers who want students to demonstrate high performance; thus, they deliver instruction around what will be assessed as well as include the assessment format within instruction. When teachers do not clearly understand the standards or the learning targets and are unsure how to design instruction, they may resort to teaching to the test. Often instruction is designed to prepare students for merely multiple-choice formats. It is essential that students not be limited to assessments that are only comprised of selected response. Herman, Osmundson, and Dietel (2010) advocated that students be given response items that trigger complex thinking and problem-solving. Constructed response items allow teachers to observe the thought processes and reasoning abilities of students. Open-ended assessment items demonstrate that curriculum and instruction should integrate rigor and depth into daily learning experiences. More specifically, instruction that focuses on memorization and is assessed with multiple-choice should not replace in-depth learning and critical thinking. The primary purpose of TEKS-Based Math Assessments is to provide a valid measure of the quality of mathematics education in the classroom or across the campus because they are aligned to the content and process standards. These assessments assist campuses in determining how well their mathematics programs are helping students achieve previously set learning goals. The results can depict patterns of performance, noting insufficient performance during the period leading up to the benchmarks. Educators might use the assessment data to predict if students are on target to meet specific end- of-the-year goals. Research seems to indicate that students score higher on standardized tests when they experience focused, aligned practice. Therefore, it is imperative that campuses under- stand why benchmarks are an integral part of the assessment system. Formative assessments are embedded in instruction and used to make in- formed, ongoing, and timely decisions relative to teaching and learning. The learning targets measured by formative assessments relate to the long-term targets assessed by these assessments.

Multiple assessments address long-term targets, yielding data to show how well students are learning at particular intervals or periods in time. This data relates to the long-term goals as measured by annual assessments (Herman et al., 2010).

At a specific point in time during the year, TEKS-Based Math Assessments measure how well students have acquired the knowledge and skills taught during mathematics instruction. The assessments are designed to ensure students are learning at their grade level. Furthermore, TEKS-Based Math Assessments provide data to teachers, schools, and school districts to support improved instructional decisions. The TEKS-Based Math Assessments serve as accountability measures to help gauge or predict future performance that might occur on state assessments. With summative assessment data, educators can pinpoint areas that require additional attention and focus.

Periodic exposure to benchmark assessments provides students with opportunities to experience a variety of assessment items and formats for each standard. These experiences will benefit students facing a common assessment. When assessment is an integral part of mathematics instruction, it contributes significantly to students' mathematical learning (Stecker et al., 2005). Assessment should inform and guide teachers as they make instructional decisions. During the school year, students can take practice tests to evaluate their

own work and progress. Teachers could create customized assessments by assigning students only the items that measure a specific standard. Students partake in these opportunities to demonstrate what they have learned. After students are supplied with immediate achievement feedback, then students may proceed to intervention settings to develop standard mastery and ensure performance gaps are closed prior to the state or common assessment administrations. As a result, TEKS-Based Math Assessments arm teachers with essential data or information that helps in the preparation of future high-quality instruction.

Results of the TEKS-Based Math Assessments provide information about the academic achievement of students. This information is used to identify individual student strengths, determine areas of challenge, and measure the quality of mathematics education across the campus. Utilization of results from various benchmark assessments can help teachers monitor student progress in order to determine future plans for instruction. The involvement of students in assessment promotes student engagement in individual learning targets. Students need to know what learning targets they are responsible for mastering, and at what level (Stiggins, 2007). Marzano (2005) states, "students who can identify what they are learning significantly outscore those who cannot."

For a balanced assessment system, formative assessments must play an essential part of class- room instruction. Formative assessment focuses on improving student performance during classroom instruction whereas summative assessment focuses on accountability and often sorts or classifies students. In formative assessment, both teacher and student share responsibility for assessment. The student and teacher share a com- mon understanding of the standards that define quality work. Both student and teacher compare performance to these standards as they assess the work task in progress and when it is completed. Following formative assessment, teaching and learning activities are adjusted to close the gap between the student's performance and the standard. The teacher not only assesses the student's performance, but also provides feedback to the student. Specific, descriptive feedback informs the student as to the next steps to take for improvement in future performance. The teacher will also assess and adjust instruction based on the assessment. Research on formative assessment suggests that students should be aware of their learning targets, their present status, and the next steps in reaching specified goals or closing any gaps (Atkin, Black, and Coffey, 2001; Black, Harrison, Lee, Marshall, and Wiliam, 2003). Such knowledge helps students keep track of their achievements, know how close they are to their learning targets, and determine future steps to advance their learning. When students are aware of individual achievement gaps and teachers motivate students with continuous feedback linked to the expected outcomes and criteria for success, students are able to steadily move forward and close performance gaps in mathematics. Black and Wiliam (1998) noted that there is evidence to support a strong relationship between interactive feedback and student achievement. Although Motivation Math Assessments are summative in nature, the item coding to content and process standards provides teachers information that could impact future instruction. Teachers could use the data in a formative manner, by adjusting future instruction and grouping to address gaps in learning. However, they are used, formative assessments are employed during instruction to advance teaching and learning; assessments provide accountability in determining student learning after instruction. This entire process provides evidence that assessment and instruction are intertwined. Thus, it is important to study the available data provided by TEKS-Based Math Assessments.

Available for Levels 1–8, TEKS-Based Math Assessments are diagnostic and prescriptive in nature. These practice assessments provide educators with detailed information on student progress as well as promoting flexibility of use in a variety of classroom settings. For each grade level, there are two different versions of the assessments (Forms A and B). Each form contains the number of test items similar to the STAAR™ test blueprints for specific levels. The Readiness Standards for each grade level are addressed in at least one assessment item per form, but Readiness Standards may have multiple test items. In order to keep the test length similar to the STAAR test blueprints, it is not possible to test each Student Expectation on each form individually. However, Forms A and B combined to address all Student Expectations. Emphasis is placed on Readiness Standards because of the importance of such standards for success in the grade, the content area, or entry into college or the work force, following the K–12 years. Supporting Standards emulate STAAR. Readiness Standards have a higher number of questions; it is the Supporting Standards that are addressed between the two forms. Test items are presented in a "real-world" context when possible. Included will be a mathematics chart with measurement equivalencies and formulas as appropriate for each level. Online tracking and reports are available that provide teachers with the data to monitor the progress of students toward standards mastery.

As shared by the United States Department of Education (2003), it is important that assessment items that align with the depth and breadth of the academic content standards. Therefore, assessment items are coded to the content student expectation, the process student expectation, to Depth of Knowledge level (DOK), and to Bloom's Taxonomy.

The model Depth of Knowledge (DOK) was developed by Norman Webb (Webb, 2002a; 2002b). Dr. Webb advocates the necessity of assessment items matching the standard. Webb stated that educators should be aware of the level of demonstration required by a student when a test item is developed; thus, he developed his four levels of DOK. Level 1 assessment items have students recall information. Level 2 items ask students to think beyond reproduction of responses. Students use more than one cognitive process or follow more than one step. Students at Level 3 demonstrate higher levels of thought than the previous levels require as these items are more complex. Responses may have multiple answers, but students must choose one and justify the reasoning behind the selection. Assessment items at Level 4 require students to form several connections with ideas. Typically, performance assessments and open-ended responses are written at this level of thought.

It appears the national shift towards preparing students to survive in the global market has impacted the assessments undertaken by students in Texas. While Texas does not adhere to the Common Core Standards (CCS) but instead chose to support TEKS, the assessment system in Texas recognizes the importance of prepared- ness for college and the work force during K–12 education years. Thus, assessments that are specifically designed to address the Mathematics TEKS will not only demonstrate if students can succeed in school but also in the real world. STAAR™ assessments will portray which students are meeting the challenge of becoming ready for college and the workforce. For the purpose of the TEKS-Based Math Assessments, the various DOK and Bloom's coding are utilized to reflect the rigor and depth in levels of thought required by students on the benchmark assessments. Assessment items displaying rigor require students to use higher levels of thought,

exhibiting a more challenging 21st century learning environment. Students may be asked to use such processes as examine, create, prioritize, decide, produce, assess, generate, or classify.

Over the past years, changes in accountability and testing have led to data playing a major role in the education of students. The U.S. Department of Education advocates the importance of data utilization for guiding instruction and improving student learning. Schools are being strongly encouraged to respond to assessment data, using it to identify students' academic strengths and needs (U.S. Department of Education, 2009). As educators face increasing accountability pressure from federal, state, and local entities to improve student achievement, data should become the central element in how students' academic progress is monitored and how instructional practices are evaluated. There is no single assessment that provides a complete picture of student performance. TEKS-Based Math Assessments offers two forms in order to keep a pulse on the progress of student performance, rather than a single snapshot assessment. Each assessment plays a prominent role in determining if quality teaching and learning are occurring. As correct and incorrect assessment answers are analyzed, teachers are able to observe the patterns of thought in which students experience difficulty or exhibit success. This data is informative in that teachers may appropriately adjust and revise instruction to more appropriately address the diversity of needs within classrooms. Thus, assessments have important implications for instruction. Research has indicated that it is essential that assessment data be used to make well informed instructional decisions (Armstrong and Anthes, 2001; Feldman and Tung, 2001; Forman, 2007; Liddle, 2000).

Assessments given periodically provide student achievement data on grade-specific Texas Essential Knowledge and Skills throughout the school year, including the ability to report student achievement approaching, falling below, or exceeding the standards. With two forms of assessment per grade, these assessment instruments are capable of providing data to measure mathematics progress and proficiency throughout the year. The benchmark assessments for math are summative in nature, intended to be administered in their entirety at two different intervals during the year after instruction has occurred.

TEKS-Based Math Assessments Forms A and B can be used in different ways: as practice, as a diagnostic instrument, and as a teaching tool. Students need opportunities to practice and develop test-taking skills. These tests focus on the skills students will be expected to demonstrate on STAAR™ assessments. After an analysis of assessment data, findings may indicate students require additional instruction to address deficits in order to achieve skill mastery and close learning gaps as students move forward toward annual learning goals. If skill deficits exist, then teachers are encouraged to explore different strategies in order to provide additional instruction and practice in order to advance student achievement. More specifically, teachers may design learning experiences to revise their curricula, develop formative assessments, examine instructional methods of delivery, target specific populations for remediation and enrichment, create student academic assistance interventions, and/or develop individual plans for student improvement. Data from the assessments will help teachers identify areas where additional instruction is necessary, thus using the assessments as teaching tools. Positive adjustments to instruction more than likely lead students to master the standard(s) at hand.

Studies support the use of several measures from which to gauge student achievement.

The Mathematics Product Development Team recognized that assessment systems should include a balance of formative and summative data to be most effective in improving outcomes and in making a significant impact on mathematics education. The development team studied available guide- lines released by the Texas Education Agency Assessment Division (TEA, 2012; TEA, 2014a; TEA, 2014b; TEA, 2014c). TEA (2016) released a range of sample test items and item specifications regarding the assessment of mathematics. This information was considered by the Mathematics Product Development Team in order to design assessment items that measure a deeper understanding. Some TEKS that address Readiness Standards reflect multiple test items within STAAR™ assessment as allowed by the STAAR™ Blueprint. Released information from the TEA indicates that STAAR™ assessments will contain two item types: multiple-choice and open-ended griddable. Griddable items are presented as fill in the blank item types to give students opportunities to formulate responses independently without being influenced by provided answer choices. The ongoing assessments include a similar number of items that are answered as fill in the blank as defined in the information released in the TEA Blueprints for Levels 3–8. The format for an online version of each form, with items following the protocol noted in the STAAR™ Blueprints (2014b). Assessments taken in the online component are computer scored. This allows teachers to access reports to use in analyzing student mastery of the standards.

As the school year progresses, students who are proficient in the various benchmarks can deter- mine how they might perform on future STAAR™ assessments in mathematics. The two forms offered at each grade enable the TEKS-Based Math Assessments to be reviewed at two intervals during the year, leaving a window of time for the state assessments to be administered. As data from the TEKS-Based Math Assessments are examined, teachers can identify students who are performing at the grade-specific standard level, those who are exceeding the standards, and those who are approaching or are functioning below the standard. Teachers could determine and chart the data on their own for the various subgroups (i.e., ethnicity, disadvantaged, special education, and English Language Learners) if desired. All subgroups must make sufficient growth in order for the school to achieve or work toward high-performance levels.

The developers of TEKS-Based Math Assessments reviewed relevant reform efforts on teaching and learning in mathematics, studied the Mathematics Texas Essential Knowledge and Skills, perused the item specifications released by the state, and employed individual expertise and collective judgment as they designed a resource to lead students into the 21st century. TEKS-Based Math Assessments focus on the grade-level Readiness and Supporting Standards for Mathematics. This focus ensures that test items align with the assessed content and process standards, resulting in appropriately written assessment items based on current information. Webb's Depth of Knowledge, and the TEKS form the basis for designing items that stimulate students' higher order thinking skills and encourage rigor and depth in thinking. With the Mathematics standards as academic guiding points, the Mentoring Minds Product Development Team for Mathematics developed TEKS-Based Math Assessments, a resource for assessing and strengthening mathematics education for Levels 1–8. the ability to report student achievement approaching, falling below, or exceeding the standards. With two forms of assessment per grade, these assessment instruments are capable of providing data to measure mathematics progress and proficiency throughout the year. The benchmark assessments for math are summative in nature, intended to be administered in their

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