



Mathematics

Standards in the Classroom:

*Classroom activities aligned to the
Texas standards for grades 6–8*

**Second
Edition**
2008



A publication of

The Charles A. Dana Center

at The University of Texas at Austin

About the University of Texas Charles A. Dana Center

The Charles A. Dana Center (www.utdanacenter.org) supports educators, education leaders, policymakers, and communities in strengthening education. As a research unit of The University of Texas at Austin's College of Natural Sciences, the Dana Center maintains a special emphasis on mathematics and science education. The Dana Center's mission is to strengthen the mathematics and science preparation and achievement of all students. We do this through supporting alignment of all key mathematics and science education components, prekindergarten–16: mathematics and science standards, accountability systems, assessments, and teacher preparation.

For more information about the Dana Center and its programs, see our homepage at www.utdanacenter.org. For additional resources to strengthen your mathematics program, see our Mathematics TEKS Toolkit at www.mathtekstoolkit.org and our web catalog at www.utdanacenter.org/catalog. For information and online signup for our additional professional development offerings for leaders and teachers, mathematics educators, and science educators, see our professional development site at www.utdanacenter.org/pd/index.php.

About the development of this book

The Charles A. Dana Center has developed this standards-aligned mathematics education resource for mathematics teachers.

The development and production of the first edition of this book, entitled *Standards in the Classroom: Resources for Grades 6–8*, was supported by the National Science Foundation under cooperative agreement #ESR-9712001 and the Charles A. Dana Center at the University of Texas at Austin. The development and production of this second edition was supported by the Charles A. Dana Center. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the the National Science Foundation or The University of Texas at Austin.

The second edition updates the Texas Essential Knowledge and Skills statements to align with the state's 2005–2006 revisions to the Mathematics TEKS. Activities and lessons have been added or updated to align with the revised TEKS. The second edition has also been re-edited for clarity and to correct some minor errors.

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TEKS and TAKS Resources

The mathematics Texas Essential Knowledge and Skills (TEKS) were developed by the state of Texas to clarify what all students should know and be able to do in mathematics in kindergarten through grade 12. Districts are required to provide instruction that is aligned with the mathematics TEKS, which were originally adopted by the State Board of Education in 1997 and implemented statewide in 1998. Revisions to the Mathematics TEKS were adopted in 2005–2006 and implemented starting in Fall 2006. The mathematics TEKS also form the objectives and student expectations for the mathematics portion of the Texas Assessment of Knowledge and Skills (TAKS).

The mathematics TEKS can be downloaded free of charge from the Dana Center's Mathematics TEKS Toolkit website (www.mathtekstoolkit.org) or the Texas Education Agency website (www.tea.state.tx.us/teks). Perfect-bound and spiral-bound versions of the mathematics and science TEKS booklets are available for a fee (to cover the costs of production) from the Charles A. Dana Center at The University of Texas at Austin (www.utdanacenter.org/catalog).

Resources for implementing the mathematics TEKS are available through the Charles A. Dana Center, regional education service centers, and the Texas Education Agency. Online resources can be found at in the Dana Center's Mathematics TEKS Toolkit at www.mathtekstoolkit.org.

Additional products and services that may be of interest are available from the Dana Center at www.utdanacenter.org. These include the following:

The following products and services are also available from the Dana Center at www.utdanacenter.org/catalog:

- *Mathematics Standards in the Classroom: Classroom Standards Aligned to the Texas Standards for Kindergarten–Grade 2* (first edition to be published in summer 2008)
- *Mathematics Standards in the Classroom: Classroom Standards Aligned to the Texas Standards for Grades 3–5* (second edition to be published in summer 2008)
- *Middle School Mathematics Assessments: Proportional Reasoning* (2004)
- *Algebra I Assessments* (2002)
- *Algebra II Assessments* (second edition, 2007)
- *Geometry Assessments* (second edition, 2007)
- Poster-sized Mathematics TEKS charts
- Professional development mathematics institutes for elementary, middle school, and high school teachers



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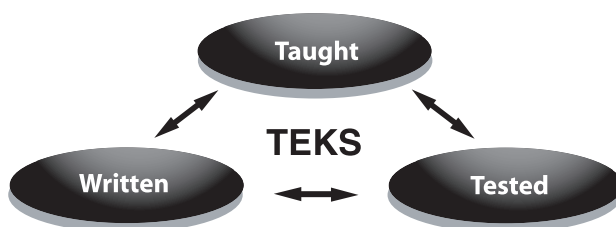
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Introduction

The Dana Center developed *Mathematics Standards in the Classroom: Classroom Activities Aligned to the Texas Standards for Grades 6–8* to help clarify mathematics content and processes that students should know and use in each grade level, and to provide links between the state curriculum standards (the Texas Essential Knowledge and Skills, TEKS), classroom instruction, and assessment.

Three components of a mathematics program are the written curriculum, how it is taught, and how it is assessed.



In Texas, the written curriculum is the TEKS and the statewide student assessment is the Texas Assessment of Knowledge and Skills (TAKS). However, it is the teacher’s responsibility to decide how the curriculum is taught, working within the context of their campus and district. These materials are intended to provide resources to help teachers make good instructional decisions and to improve the alignment of their instructional program.

The National Council of Teachers of Mathematics lists as one of its six principles for school mathematics that “Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.”

NCTM identified the following six standards to guide classroom assessment:

The Mathematics Standard: Assessment should reflect the mathematics that all students need to know and be able to do.

The Learning Standard: Assessment should enhance mathematics learning.

The Equity Standard: Assessment should promote equity.

The Openness Standard: Assessment should be an open process.

The Inferences Standard: Assessment should promote valid inferences about mathematics learning.

The Coherence Standard: Assessment should be a coherent process.

¹National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics. (Summary available at standards.nctm.org.)

²National Council of Teachers of Mathematics. (1995). *Assessment Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics, pages 11, 13, 15, 17, 19, and 21.

Implementing these assessment standards may require significant changes in how teachers view and use assessment in the mathematics classroom. Teachers should assess frequently to monitor individual performance and guide instruction. This book can be used to incorporate ongoing classroom assessment as part of instruction, so teachers can be confident that their students understand and can do what is required by the TEKS and what will be assessed on the TAKS.

How to use this book

Part 1: Clarifying Activities with Assessment Connections

The organization of the clarifying activities is based on the content strands in the TEKS. The strands include

- Number, operations, and quantitative reasoning (chapter 1)
- Patterns, relationships, and algebraic thinking (chapter 2)
- Geometry and spatial reasoning (chapter 3)
- Measurement (chapter 4)
- Probability and statistics (chapter 5)
- Underlying processes and mathematical tools (chapter 6)

Each chapter in part 1 provides activities that address the student expectations in the mathematics TEKS for grades 6 through 8. Each chapter also gives examples of how those expectations may be tested on the TAKS. The activities are connected to released TAKS items, which can be accessed on the TEA website (www.tea.state.tx.us).

The Clarifying Activities with Assessment Connections answer the following questions:

- What is an example of something students would be doing to meet this student expectation?
- What do I, as a teacher, ask, listen for, and look for in order to check for student understanding?
- How does this assessment task link to the Texas Assessment of Knowledge and Skills (TAKS)?

The activities with assessment connections use the same numbering system as the TEKS. For example, Activity 6.1B addresses the second student expectation (B) for the first knowledge and skills statement (1) in the Grade 6 TEKS.

For each student expectation in the Grades 6–8 mathematics TEKS, this resource provides a classroom activity and sample questioning and observation suggestions that can reveal a student’s mathematical thinking.

The questions accompanying each activity begin with a broad question to open conversations that allow students an opportunity to share strategies and ideas that they have formulated. Probing questions follow as suggestions to guide students' thinking, to prompt further discussion, and to allow the teacher to gain insights about misconceptions and strategies not uncovered by the opening question. These probing questions are not limited to this student expectation but can address other mathematical ideas useful to guide instructional decisions.

The observational suggestions in each activity provide guidance for what the teacher should listen for and look for as students work through the activity. Where possible, each activity has a sample item—the TAKS Connection—that demonstrates how the student's understanding of the content described in the TEKS has been tested on the TAAS or may be addressed on the TAKS.

The strand containing Underlying Processes and Mathematical Tools will reference other TEKS whose tasks highlight these process skills. These process standards can be developed throughout the mathematics curriculum and be integrated among all strands. Sample items of TAKS connection will be found at the end of the chapter.

Part 2: Clarifying Lessons

Clarifying Lessons show how lessons or activities can combine several TEKS content strands, knowledge and skills statements, and student expectations. The chapters in part 2 are organized by grade level. Each chapter includes two Clarifying Lessons.

These lessons serve as models for teachers for creating new lessons and provide examples of important instructional components, including motivational techniques and effective questioning. Clarifying Lessons answer the following questions:

- How do I teach my students the knowledge and skills necessary to meet this student expectation?
- What does a lesson look like that addresses this student expectation?
- How can I assess this student expectation?
- How can this part of the TEKS be connected to other parts of the TEKS?

A clarifying lesson gives the teacher a complete lesson that can be implemented in the classroom. It models how to build a lesson that combines several student expectations from the TEKS. Each lesson includes a lesson overview, a mathematics overview, the TEKS expectations addressed, and a list of materials needed to complete the lesson.

Each lesson begins with a set-up, which introduces students to an idea and motivates them to participate. Guiding questions help teachers engage students in mathematical thinking during the lesson, and then summary questions direct students' attention to the key mathematics in the lesson. Finally, assessment tasks identify the mathematics that students have learned in the lesson.

Who Should Use This Resource?

This resource is intended primarily for teachers, but professional development providers, parents, and others may also find the activities and lessons valuable.

Teachers can use this resource to develop a deeper understanding of the TEKS and to help make instructional decisions to enhance student learning. The resource offers models that teachers can use to create their own activities, lessons, and assessments. Each activity and lesson provides opportunities for classroom assessment embedded within the curriculum in formal or informal classroom conditions.

When using the activities and lessons for formal evaluation of student understanding, teachers must make decisions about how to introduce the activity or lesson, ask the guiding questions, and score the assessment. When using the activities and lessons informally, teachers gain information by observing what strategies a student uses, what questions the student asks, and what the student knows or is struggling with. The activities and lessons are grouped by TEKS content strand to allow teachers flexibility when selecting tasks that are appropriate to the needs of the students. The tasks may also serve as an integral part of instruction to guide teachers as they make instructional decisions to enhance student learning.

The use of questions, observations, and interactions with students should be part of everyday instruction, so that students will be more likely to continue to learn through the process of questioning. When assessment becomes part of routine instruction and practice, teachers can use the assessment information they gather to better inform them about the students' progress. Teachers can use the time while they are observing students and asking questions to capture and record information about student understanding. This information can then be used as the basis for sharing with other teachers and with parents how the student learns.

Professional development providers may use this resource to engage teachers in a deeper understanding of the TEKS by helping them transform these strategies into customized classroom activities, lessons, and assessments.

Parents, mentors, tutors, and others can use this resource to discover what their students know, and what the students must learn about mathematics.

Editor's Note

The Texas Essential Knowledge and Skills TEKS is organized by statements of what the student is expected to learn, each followed by a list of specific knowledge and skills expectations. Because we excerpt these expectations from the TEKS with one item from a list at a time, we have removed the final punctuation from these items. For example, when we excerpt just one bulleted item from the following list, we remove the semi-colon, the “and,” or the period to limit confusion:

- (6.1) The student represents and uses rational numbers in a variety of equivalent forms.

The student is expected to:

- (A) compare and order non-negative rational numbers;
- (B) generate equivalent forms of rational numbers including whole numbers, fractions, and decimals;
- (C) use integers to represent real-life situations;
- (D) write prime factorizations using exponents; and
- (E) identify factors and multiples including common factors and common multiples.

Otherwise, we have excerpted the TEKS expectations exactly as they are printed in the original.

