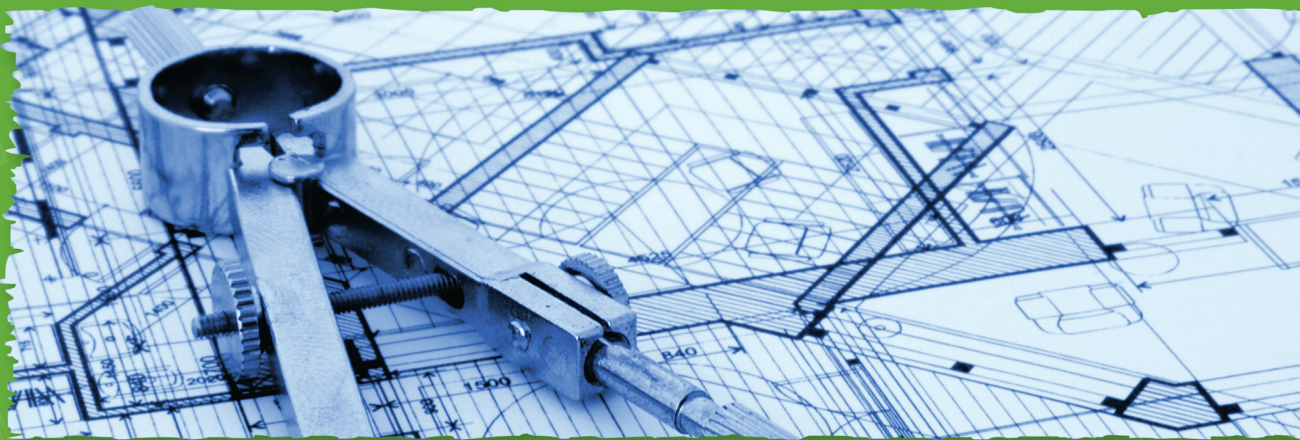




SHELL
EDUCATION

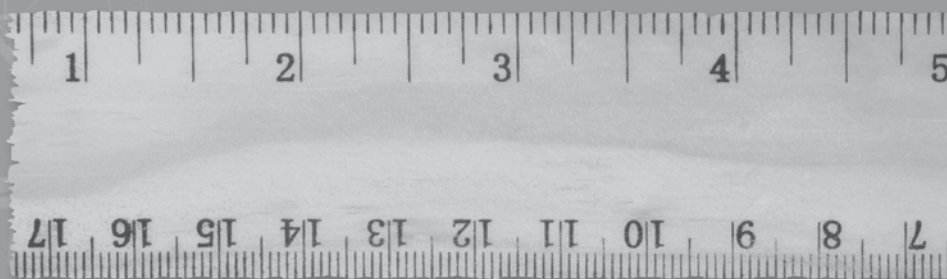
Leveled Texts for Mathematics

Measurement



Leveled Texts for Mathematics

Measurement



Author

Christi Sorell



SHELL EDUCATION

Consultant

Barbara Talley, M.S.
Texas A&M University

Publishing Credits

Dona Herweck Rice, *Editor-in-Chief*; Lee Aucoin, *Creative Director*; Don Tran, *Print Production Manager*; Sara Johnson, M.S.Ed., *Senior Editor*; Hillary Wolfe, *Editor*; Stephanie Paris, *Editor*; Evelyn Garcia, *Associate Education Editor*; Neri Garcia, *Cover Designer*; Juan Chavolla, *Production Artist*; Stephanie Reid, *Photo Editor*; Corinne Burton, M.S.Ed., *Publisher*

All images from Shutterstock.com

Shell Education

5301 Oceanus Drive

Huntington Beach, CA 92649

<http://www.shelleducation.com>

ISBN 978-1-4258-0754-2

©2011 Shell Educational Publishing, Inc.

The classroom teacher may reproduce copies of materials in this book for classroom use only. The reproduction of any part for an entire school or school system is strictly prohibited. No part of this publication may be transmitted, stored, or recorded in any form without written permission from the publisher.

Table of Contents

What Is Differentiation?	4
How to Differentiate Using This Product	5
General Information About the Student Populations	6
Below-Grade-Level Students.....	6
English Language Learners.....	6
On-Grade-Level Students	7
Above-Grade-Level Students	7
Strategies for Using the Leveled Texts	8
Below-Grade-Level Students.....	8
English Language Learners.....	11
Above-Grade-Level Students	14
How to Use This Product	16
Readability Chart.....	16
Components of the Product.....	16
Tips for Managing the Product	18
Correlation to Mathematics Standards	19
Leveled Texts	21
Measuring the Length of Objects.....	21
Measuring the Weight of Objects.....	29
Measuring Time.....	37
Measuring Temperature	45
Measuring Angles	53
Estimating Measurements.....	61
Converting Length	69
Converting Weight	77
Measuring the Perimeter of Regular Shapes	85
Measuring the Area of Regular Shapes.....	93
Measuring the Perimeter of Irregular Shapes.....	101
Measuring the Area of Irregular Shapes	109
Measuring the Volume of Solids and Liquids	117
Converting Volume	125
Measuring Surface Area	133
Appendices	141
References Cited	141
Digital Resources	142

What Is Differentiation?

Over the past few years, classrooms have evolved into diverse pools of learners. Gifted students, English language learners, special needs students, high achievers, underachievers, and average students all come together to learn from one teacher. The teacher is expected to meet their diverse needs in one classroom. It brings back memories of the one-room schoolhouse during early American history. Not too long ago, lessons were designed to be one size fits all. It was thought that students in the same grade level learned in similar ways. Today, we know that viewpoint to be faulty. Students have differing learning styles, come from different cultures, experience a variety of emotions, and have varied interests. For each subject, they also differ in academic readiness. At times, the challenges teachers face can be overwhelming, as they struggle to figure out how to create learning environments that address the differences they find in their students.

What is differentiation? Carol Ann Tomlinson at the University of Virginia says, “Differentiation is simply a teacher attending to the learning needs of a particular student or small group of students, rather than teaching a class as though all individuals in it were basically alike” (2000). Differentiation can be carried out by any teacher who keeps the learners at the forefront of his or her instruction. The effective teacher asks, “What am I going to do to shape instruction to meet the needs of all my learners?” One method or methodology will not reach all students.

Differentiation encompasses what is taught, how it is taught, and the products students create to show what they have learned. When differentiating curriculum, teachers become the organizers of learning opportunities within the classroom environment. These categories are often referred to as content, process, and product.

- **Content:** Differentiating the content means to put more depth into the curriculum through organizing the curriculum concepts and structure of knowledge.
- **Process:** Differentiating the process means using varied instructional techniques and materials to enhance students’ learning.
- **Product:** When products are differentiated, cognitive development and the students’ abilities to express themselves improve, as they are given different product options.

Teachers should differentiate content, process, and product according to students’ characteristics, including students’ readiness, learning styles, and interests.

- **Readiness:** If a learning experience aligns closely with students’ previous skills and understanding of a topic, they will learn better.
- **Learning styles:** Teachers should create assignments that allow students to complete work according to their personal preferences and styles.
- **Interests:** If a topic sparks excitement in the learners, then students will become involved in learning and better remember what is taught.

How to Differentiate Using This Product

According to the Common Core State Standards (2010), all students need to learn to read and discuss concepts across the content areas in order to be prepared for college and beyond. The leveled texts in this series help teachers differentiate mathematics content for their students to allow all students access to the concepts being explored. Each book has 15 topics, and each topic has a text written at four different reading levels. (See page 17 for more information.) While these texts are written at a variety of reading levels, all the levels remain strong in presenting the mathematics content and vocabulary. Teachers can focus on the same content standard or objective for the whole class, but individual students can access the content at their instructional reading levels rather than at their frustration levels.

Determining your students' instructional reading levels is the first step in the process. It is important to assess their reading abilities often so they do not get tracked into one level. Below are suggested ways to determine students' reading levels.

- **Running records:** While your class is doing independent work, pull your below-grade-level students aside, one at a time. Have them read aloud the lowest level of a text (the star level) individually as you record any errors they make on your own copy of the text. If students read accurately and fluently and comprehend the material, move them up to the next level and repeat the process. Following the reading, ask comprehension questions to assess their understanding of the material. Use your judgment to determine whether students seem frustrated as they read. As a general guideline, students reading below 90% accuracy are likely to feel frustrated as they read. There are also a variety of published reading assessment tools that can be used to assess students' reading levels with the running record format.
- **Refer to other resources:** Other ways to determine instructional reading levels include checking your students' Individualized Education Plans (IEP), asking the school's resource teachers, or reviewing test scores. All of these resources should be able to give you the additional information you need to determine the reading level to begin with for your students.

Teachers can also use the texts in this series to scaffold the content for their students. At the beginning of the year, students at the lowest reading levels may need focused teacher guidance. As the year progresses, teachers can begin giving students multiple levels of the same text to allow them to work independently to improve their comprehension. This means each student would have a copy of the text at his or her independent reading level and instructional reading level. As students read the instructional-level texts, they can use the lower texts to better understand the difficult vocabulary. By scaffolding the content in this way, teachers can support students as they move up through the reading levels. This will encourage students to work with texts that are closer to the grade level at which they will be tested.

General Information About the Student Populations

Below-Grade-Level Students

By Dennis Benjamin

Gone are the days of a separate special education curriculum. Federal government regulations require that special needs students have access to the general education curriculum. For the vast majority of special needs students today, their Individualized Education Plans (IEPs) contain current and targeted performance levels but few short-term content objectives. In other words, the special needs students are required to learn the same content as their on-grade-level peers.

Be well aware of the accommodations and modifications written in students' IEPs. Use them in your teaching and assessment so they become routine. If you hold high expectations of success for all of your students, their efforts and performances will rise as well. Remember the root word of *disability* is *ability*. Go to the root needs of the learner and apply good teaching. The results will astound and please both of you.

English Language Learners

By Marcela von Vacano

Many school districts have chosen the inclusion model to integrate English language learners into mainstream classrooms. This model has its benefits as well as its drawbacks. One benefit is that English language learners may be able to learn from their peers by hearing and using English more frequently. One drawback is that these second-language learners cannot understand academic language and concepts without special instruction. They need sheltered instruction to take the first steps toward mastering English. In an inclusion classroom, the teacher may not have the time or necessary training to provide specialized instruction for these learners.

Acquiring a second language is a lengthy process that integrates listening, speaking, reading, and writing. Students who are newcomers to the English language are not able to process information until they have mastered a certain number of structures and vocabulary words. Students may learn social language in one or two years. However, academic language takes up to eight years for most students.

Teaching academic language requires good planning and effective implementation. Pacing, or the rate at which information is presented, is another important component in this process. English language learners need to hear the same word in context several times, and they need to practice structures to internalize the words. Reviewing and summarizing what was taught are absolutely necessary for English language learners.

General Information About the Student Populations *(cont.)*

On-Grade-Level Students

By Wendy Conklin

On-grade-level students often get overlooked when planning curriculum. More emphasis is usually placed on those who struggle and, at times, on those who excel. Teachers spend time teaching basic skills and even go below grade level to ensure that all students are up to speed. While this is a noble endeavor and is necessary at times, in the midst of it all, the on-grade-level students can get lost in the shuffle. We must not forget that differentiated strategies are good for the on-grade-level students, too. Providing activities that are too challenging can frustrate these students; on the other hand, assignments that are too easy can be boring and a waste of their time. The key to reaching this population successfully is to find just the right level of activities and questions while keeping a keen eye on their diverse learning styles.

Above-Grade-Level Students

By Wendy Conklin

In recent years, many state and school district budgets have cut funding that has in the past provided resources for their gifted and talented programs. The push and focus of schools nationwide is proficiency. It is important that students have the basic skills to read fluently, solve problems, and grasp mathematical concepts. As a result, funding has been redistributed in hopes of improving test scores on state and national standardized tests. In many cases, the attention has focused only on improving low test scores to the detriment of the gifted students who need to be challenged.

Differentiating the products you require from your students is a very effective and fairly easy way to meet the needs of gifted students. Actually, this simple change to your assignments will benefit all levels of students in your classroom. While some students are strong verbally, others express themselves better through nonlinguistic representation. After reading the texts in this book, students can express their comprehension through different means, such as drawings, plays, songs, skits, or videos. It is important to identify and address different learning styles. By giving more open-ended assignments, you allow for more creativity and diversity in your classroom. These differentiated products can easily be aligned with content standards. To assess these standards, use differentiated rubrics.

Strategies for Using the Leveled Texts

Below-Grade-Level Students

By Dennis Benjamin

Vocabulary Scavenger Hunt

A valuable prereading strategy is a Vocabulary Scavenger Hunt. Students preview the text and highlight unknown words. Students then write the words on specially divided pages. The pages are divided into quarters with the following headings: *Definition*, *Sentence*, *Examples*, and *Nonexamples*. A section called *Picture* can be placed over the middle of the chart to give students a visual reminder of the word and its definition.

Example Vocabulary Scavenger Hunt

estimate

Definition to determine roughly the size or quantity	Sentence We need to estimate how much paint we will need to buy.
Examples estimating a distance; estimating an amount	Nonexamples measuring to an exact number; weighing and recording an exact weight

This encounter with new vocabulary enables students to use it properly. The definition identifies the word's meaning in student-friendly language. The sentence should be written so that the word is used in context. This helps the student make connections with background knowledge. Illustrating the sentence gives a visual clue. Examples help students prepare for factual questions from the teacher or on standardized assessments. Nonexamples help students prepare for *not* and *except for* test questions such as "All of these are polygons *except for*..." and "Which of these terms in this expression is not a constant?" Any information the student was unable to record before reading can be added after reading the text.

Strategies for Using the Leveled Texts *(cont.)*

Below-Grade-Level Students *(cont.)*

Graphic Organizers to Find Similarities and Differences

Setting a purpose for reading content focuses the learner. One purpose for reading can be to identify similarities and differences. This is a skill that must be directly taught, modeled, and applied. The authors of *Classroom Instruction That Works* state that identifying similarities and differences “might be considered the core of all learning” (Marzano, Pickering, and Pollock 2001). Higher-level tasks include comparing and classifying information and using metaphors and analogies. One way to scaffold these skills is through the use of graphic organizers, which help students focus on the essential information and organize their thoughts.

Example Classifying Graphic Organizer

Equation	Constants	Variables	Number of Terms
$7 + 12 = 19$	7, 12, 19	none	3
$3x = 12$	12	x	2
$a + b$	none	a, b	2
$a^2 + b^2 + c^2$	none	a, b, c	3

The Riddles Graphic Organizer allows students to compare and contrast two-dimensional shapes using riddles. Students first complete a chart you’ve designed. Then, using that chart, they can write summary sentences. They do this by using the riddle clues and reading across the chart. Students can also read down the chart and write summary sentences. With the chart below, students could write the following sentences: A circle is not a polygon. The interior angles of a triangle always add up to 180° .

Example Riddles Graphic Organizer

What Am I?	Circle	Square	Triangle	Rectangle
I come in different configurations.			x	x
I am a polygon.		x	x	x
I am a closed shape.	x	x	x	x
My interior angles always add up to 180° .			x	
I have at least three vertices.		x	x	x

Strategies for Using the Leveled Texts *(cont.)*

Below-Grade-Level Students *(cont.)*

Framed Outline

This is an underused technique that bears great results. Many below-grade-level students have problems with reading comprehension. They need a framework to help them attack the text and gain confidence in comprehending the material. Once students gain confidence and learn how to locate factual information, the teacher can fade out this technique.

There are two steps to successfully using this technique. First, the teacher writes cloze sentences. Second, the students complete the cloze activity and write summary sentences.

Example Framed Outline

A _____ graph is used to show how two variables may be related to each other. A graph should have a _____. The axes should be labeled and a proper scale should be shown.

Summary Sentences

A good graph should correctly show the data. It should have a title; the axes should be labeled correctly; it should show the proper scale.

Modeling Written Responses

A frequent criticism heard by special educators is that below-grade-level students write poor responses to content-area questions. This problem can be remedied if resource and classroom teachers model what good answers look like. While this may seem like common sense, few teachers take the time to do this. They just assume all children know how to respond in writing.

This is a technique you may want to use before asking your students to respond to the You Try It questions associated with the leveled texts in this series. First, read the question aloud. Then, write the question on the board or an overhead and think aloud about how you would go about answering the question. Next, solve the problem showing all the steps. Introduce the other problems and repeat the procedure. Have students explain how they solved the problems in writing so that they make the connection that quality written responses are part of your expectations.

Strategies for Using the Leveled Texts *(cont.)*

English Language Learners

By Marcela von Vacano

Effective teaching for English language learners requires effective planning. In order to achieve success, teachers need to understand and use a conceptual framework to help them plan lessons and units. There are six major components to any framework. Each is described in detail below.

1. Select and Define Concepts and Language Objectives—Before having students read one of the texts in this book, the teacher must first choose a mathematical concept and language objective (reading, writing, listening, or speaking) appropriate for the grade level. Then, the next step is to clearly define the concept to be taught. This requires knowledge of the subject matter, alignment with local and state objectives, and careful formulation of a statement that defines the concept. This concept represents the overarching idea. The mathematical concept should be written on a piece of paper and posted in a visible place in the classroom.

By the definition of the concept, post a set of key language objectives. Based on the content and language objectives, select essential vocabulary from the text. The number of new words selected should be based on students' English language levels. Post these words on a word wall that may be arranged alphabetically or by themes.

2. Build Background Knowledge—Some English language learners may have a lot of knowledge in their native language, while others may have little or no knowledge. The teacher will want to build the background knowledge of the students using different strategies such as the following:

Visuals: Use posters, photographs, postcards, newspapers, magazines, drawings, and video clips of the topic you are presenting.

Realia: Bring real-life objects to the classroom. If you are teaching about measurement, bring in items such as thermometers, scales, time pieces, and rulers.

Vocabulary and Word Wall: Introduce key vocabulary in context. Create families of words. Have students draw pictures that illustrate the words and write sentences about the words. Also, be sure you have posted the words on a word wall in your classroom.

Desk Dictionaries: Have students create their own desk dictionaries using index cards. On one side, they should draw a picture of the word. On the opposite side, they should write the word in their own language and in English.

Strategies for Using the Leveled Texts *(cont.)*

English Language Learners *(cont.)*

3. Teach Concepts and Language Objectives—The teacher must present content and language objectives clearly. He or she must engage students using a hook and must pace the delivery of instruction, taking into consideration students' English language levels. The concept or concepts to be taught must be stated clearly. Use the first languages of the students whenever possible or assign other students who speak the same languages to mentor and to work cooperatively with the English language learners.

Lev Semenovich Vygotsky, a Russian psychologist, wrote about the Zone of Proximal Development (ZPD). This theory states that good instruction must fill the gap that exists between the present knowledge of a child and the child's potential (1978). Scaffolding instruction is an important component when planning and teaching lessons. English language learners cannot jump stages of language and content development. You must determine where the students are in the learning process and teach to the next level using several small steps to get to the desired outcome. With the leveled texts in this series and periodic assessment of students' language levels, teachers can support students as they climb the academic ladder.

4. Practice Concepts and Language Objectives—English language learners need to practice what they learn with engaging activities. Most people retain knowledge best after applying what they learn to their own lives. This is definitely true for English language learners. Students can apply content and language knowledge by creating projects, stories, skits, poems, or artifacts that show what they learned. Some activities should be geared to the right side of the brain. For students who are left-brain dominant, activities such as defining words and concepts, using graphic organizers, and explaining procedures should be developed. The following teaching strategies are effective in helping students practice both language and content:

Simulations: Students learn by doing. For example, when teaching about data analysis, have students do a survey about their classmates' favorite sports. First, students make a list of questions and collect the necessary data. Then, they tally the responses and determine the best way to represent the data. Lastly, students create a graph that shows their results and display it in the classroom.

Literature response: Read a text from this book. Have students choose two concepts described or introduced in the text. Ask students to create a conversation two people might have to debate which concept is useful. Or, have students write journal entries about real-life ways they use these mathematical concepts.

Strategies for Using the Leveled Texts *(cont.)*

English Language Learners *(cont.)*

4. Practice Concepts and Language Objectives *(cont.)*

Have a short debate: Make a controversial statement such as “It isn’t necessary to learn addition.” After reading a text in this book, have students think about the question and take a position. As students present their ideas, one student can act as a moderator.

Interview: Students may interview a member of the family or a neighbor in order to obtain information regarding a topic from the texts in this book. For example: What are some ways you use geometry in your work?

5. Evaluation and Alternative Assessments—We know that evaluation is used to inform instruction. Students must have the opportunity to show their understanding of concepts in different ways and not only through standard assessments. Use both formative and summative assessments to ensure that you are effectively meeting your content and language objectives. Formative assessment is used to plan effective lessons for a particular group of students. Summative assessment is used to find out how much the students have learned. Other authentic assessments that show day-to-day progress are: text retelling, teacher rating scales, student self-evaluations, cloze testing, holistic scoring of writing samples, performance assessments, and portfolios. Periodically assessing student learning will help you ensure that students continue to receive the correct levels of texts.

6. Home-School Connection—The home-school connection is an important component in the learning process for English language learners. Parents are the first teachers, and they establish expectations for their children. These expectations help shape the behavior of their children. By asking parents to be active participants in the education of their children, students get a double dose of support and encouragement. As a result, families become partners in the education of their children and chances for success in your classroom increase.

You can send home copies of the texts in this series for parents to read with their children. You can even send multiple levels to meet the needs of your second-language parents as well as your students. In this way, you are sharing your mathematics content standards with your whole second-language community.

Strategies for Using the Leveled Texts *(cont.)*

Above-Grade-Level Students

By Wendy Conklin

Open-Ended Questions and Activities

Teachers need to be aware of activities that provide a ceiling that is too low for gifted students. When given activities like this, gifted students become bored. We know these students can do more, but how much more? Offering open-ended questions and activities will give high-ability students the opportunities to perform at or above their ability levels. For example, ask students to evaluate mathematical topics described in the texts, with questions such as “Do you think students should be allowed to use calculators in math?” or “What do you think you would need to build a two-story dog house?” These questions require students to form opinions, think deeply about the issues, and form several different responses in their minds. To questions like these, there really is no single correct answer.

The generic, open-ended question stems listed below can be adapted to any topic. There is one You Try It question for each topic in this book. Use questions or statements like the ones shown here to develop further discussion for the leveled texts.

- In what ways did...
- How might you have done this differently...
- What if...
- What are some possible explanations for...
- How does this affect...
- Explain several reasons why...
- What problems does this create...
- Describe the ways...
- What is the best...
- What is the worst...
- What is the likelihood...
- Predict the outcome...
- Form a hypothesis...
- What are three ways to classify...
- Support your reason...
- Make a plan for...
- Propose a solution...
- What is an alternative to...