Texas Mathematics Teacher

Volume XLI Issue 1 Spring/Summer 2014

Find the Mathematics...

... in a hillside star!

see page 15

photo by Veronica Hernandez

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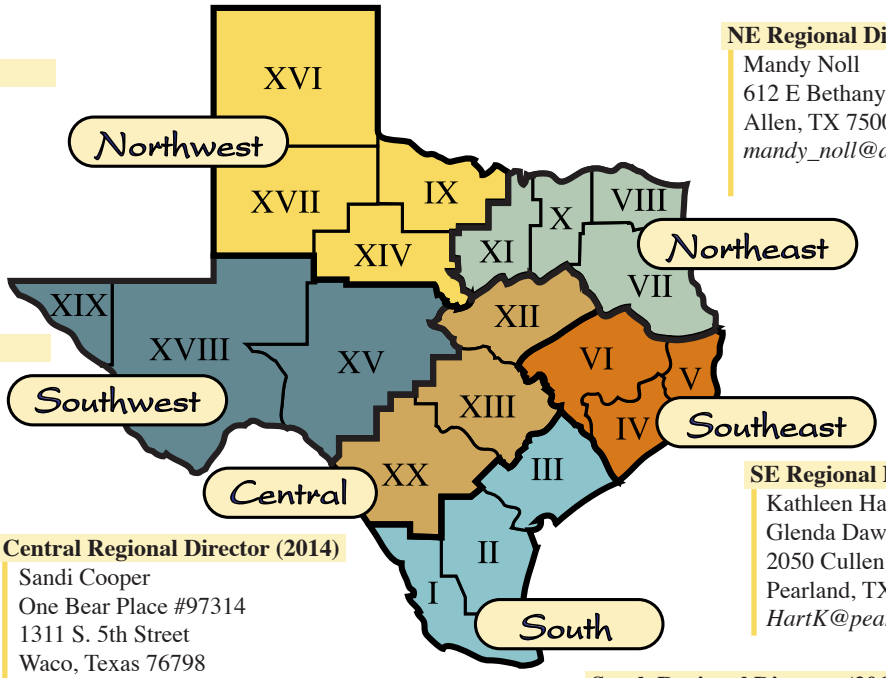

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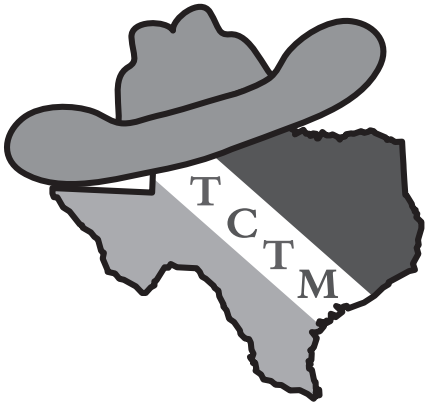

Texas Mathematics Teacher

A PUBLICATION OF THE TEXAS COUNCIL OF TEACHERS OF MATHEMATICS

Volume XLI Issue 1 **Spring/Summer 2014**

cover photo Veronica Hernandez

Articles

Features

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TCTM Applications

All applications (including TCTM membership) are available online at <*www.tctmonline.org*>.

Letter from the President

Dear TCTM colleagues,

Summer is here, and it's time for picnics, playing at the beach, gardening, and professional reflection and rejuvenation. In the same way that crops need to be rotated so that soil can be replenished, teachers need time away from the classroom to renew professional discoveries, ideas and inspiration for the new school year.

Your TCTM professional journal, Texas Mathematics Teacher, our amazing CAMT conference (Conference for the Advancement of Mathematics Teaching), and local affiliate events (see Lone Star News in your journal) can offer ways to renew that relate directly to your teaching practice. This year Texans, especially, will have an added treat --- NCTM regional will be held in Houston, November 19-21, 2014.

Once you have taken time to regroup and recuperate, I think you will find yourself excited to think more deeply about teaching and your own teaching practices. Summer is an excellent time to catch up on your professional reading. There are some great education books to include in your summer reading; two are reviewed in this issue of your journal. Of course NCTM's newest publication "Principles to Actions: Ensuring Mathematical Success for All " is a must read. Also enjoyable are the many fiction books about math. Past NCTM president Linda M. Gojak has recommended the following:

- *The Calculus Diaries: How Math Can Help You Lose Weight, Win in Vegas, and Survive a Zombie Apocalypse* by Jennifer Ouellette
- *A Wrinkle in Time* by Madeleine L 'Engle
- *The Phantom* Tollbooth by Norton Juster
- *The Joy of x: A Guided Tour of Math, from One to Infinity* by Steven Strogatz
- *Here's Looking at Euclid: From Counting Ants to Games of Chance—An Awe-Inspiring Journey Through the World of Numbers* by Alex Bellos

Although the common perception is that teachers get time off during the summer, we know that we use the summer to prepare ourselves for a new school year. However time is the one thing that every teacher needs more of, no matter if this is your first or thirty-first year in the classroom, no teacher has enough hours in the school day. But perhaps you can take advantage of these 'hints' from a veteran teacher in making your limited "free" time count each week:

1. Start with a Detailed Plan

Map out the details of your week the Friday prior. That's right, the Friday BEFORE the week ahead! As you build your plan carefully consider what you want to accomplish – both personally and professionally. This way, you head into the weekend with clear heads and much less stress.

2. Batch Process Your Work

Most prep periods end up being a little bit of this, a little bit of that, and by the time you've used the restroom, filled your water bottle, and decompressed for a second . . . wait, who are those 30 students walking in the door already?

Try this instead. Look ahead at your entire week and determine which prep periods are dedicated to planning, to grading, and so on. If you do your "like items" all at once, you will get into an efficiency groove. And while you're at it, try packing your lunches for the entire week at the same time. A participant in one of my trainings taught me about 'salads in a jar' – you should give them a try! They're wonderful!

3. Consider Your Energy Levels

Let's be real. At the end of any teaching day, you're exhausted. Instead of staggering around at 4 PM in search of a cola or chocolate, become mindful of when you are capable of doing higher-level work and when all you can manage is an easy task. Plan your lower-energy work, like quick emails, or erasing the board, for when you really just want to crash. There's just no sense in trying to write an awesome lesson when you are dead-dog tired.

I hope that these ideas and your TCTM membership serve you well in the coming months. Beginning in January 2015, you will have a few new TCTM board members and a new president, Martha Godwin. I know that you will enjoy hearing from her in the future.

Teach well and remember each student in your classroom is somebody's whole entire world.

Sincerely,

Mary Alice Hatchett
TCTM President
<mahat@earthlink.net>

Website: *<www.tctmonline.org>*

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Affiliate Groups

See our website <*www.tctmonline.org*> and the back cover of this issue for dates of upcoming events in your area. These are local affiliated groups in Texas. If you are actively involved with them, please send future meeting and conference information to Cynthia Schneider at <*cschneider@utexas.edu*> so we may publicize your events. Contact information for each group is available on the NCTM website, <*www.nctm.org*>. Contact information for regional directors is located on the inside front cover.

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Central Texas CTM
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Location Waco, Texas, Baylor University MMCSI Room 101.

Spring Conference-January 31, 2015 8-1 p.m.
Location: University High School, Waco, Texas

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STATEWIDE

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NATIONAL

National Council of Teachers of Mathematics (NCTM) visit <*nctm.org*>.

Higher-Order Thinking in Algebra: Barriers and Opportunities

It has been said that learning to think (rather than do) is the major objective of education (Dewey, 1933). After all, thinking enables us (and our students) to tackle new problems, to identify problems previously unknown, and to question the world around us. The ability to engage in higher-order thinking skills in mathematics has major implications for students' lives and career trajectory, particularly in Texas, as individuals with strong algebra skills will have greater opportunities and advantages in higher education and in the job market (Haycock, 2003; U.S. Department of Education, 1997). For these reasons, we believe it is necessary to teach students how to think, reason, and problem solve effectively in mathematics (Ennis, 1985).

Classrooms are tasked with preparing students with the thinking skills required to be successful in not only college level courses (Usiskin, 1995), but also in life. Broadly, Algebra I is often viewed as the "gateway" course to higher mathematics coursework, and therefore to the aforementioned opportunities and advantages (U.S. Department of Education, 1997). In Texas, this course is under even more scrutiny, as the Algebra I End of Course Exam (EOC) will soon be the only exam required for graduation. Moreover, the EOC assesses all testable standards in a course as opposed to just some (as the Texas Assessment of Knowledge and Skills (TAKS) did), and items on the test mirror the revised Texas Essential Knowledge and Skills (TEKS). On the surface, this implies that because of these tests and more rigorous standards (as defined by TEA), there is a need to engage students in higher-order thinking in Algebra I specifically.

We argue that there is, indeed, a need to engage Algebra I students in higher-order thinking, but share the concern that the widely standardized and high-stakes nature of testing in Algebra I may hinder efforts to engage students in types of higher-order thinking, despite revised standards. The purpose of this paper is to support teachers in designing classroom instruction to not only meet standards, but also support higher-order thinking by (a) exploring the current literature on "thinking" and how this relates to mathematics teaching and learning; (b) discussing the difficulties in using research-based frameworks in practice; (c) exploring the issues related to encouraging higher-order thinking that arise in a "testing culture" and (d) discussing higher-ordered thinking within algebra instruction.

"Thinking" Terms in Mathematics and Difficulties in Practice

In the literature, the notion of thinking is structured and branded in numerous ways. For example, critical, creative, higher-order, and generative thinking are categories of thinking that have been dominant in the field. Most of these categories are further delineated using some variation of a hierarchy that distinguishes different levels of thinking, generally starting with simple recall (e.g., writing the memorized formula for the area of a triangle) and culminating in synthesis and creation (e.g., generating the formula for the area of a triangle based on knowing the area of a rectangle).

Bloom's Taxonomy (Brooker, 2007), for example, is widely referenced in practitioner literature and is often used to design instruction. This way of organizing levels of thought is useful in thinking about how and why to engage students in higher-order thinking, and what these types of thinking might look like in mathematics classrooms. The original Bloom's Taxonomy (1956) consists of six levels of understanding: knowledge, comprehension, application, analysis, synthesis, and evaluation. Anderson et. al (2001) provided a revised version of Bloom's Taxonomy which we will use here. The cognitive process dimension of this version also consists of six hierarchical levels: remembering, understanding, applying, analyzing, evaluating, and creating, though the hierarchy is not as rigid as in the original version (Krathwohl, 2002). The most important changes from the original Taxonomy include the renaming of three categories, and the interchanging of two categories. Further, the category names were slightly altered from noun to verb form, to "fit the way they are used in objectives" (Krathwohl, 2002, p. 214).

Table 1 provides an overview of each revised level

through a mathematical lens. Specifically, an example about calculating area is adapted to show the progression of thinking that is theoretically required at each level. The "lowest" category of Bloom's, remembering, requires an individual to match the formula for calculating area of the shape. Knowledge at this level requires an individual to memorize and recall formulas and align them with the appropriate figure. The levels progress to the "highest" category of Bloom's, creating, which requires the individual to generate new understandings through the combining or reorganizing of concepts. In this case, the example asks for the area of floor covered by carpets; however, the carpets are irregularly shaped and overlapping this is the criteria.

(i.e., evaluating and creating), however, are not hierarchical, which makes task design and analysis difficult. For example, a task that requires creating can require evaluative thinking, and vice versa, so students do not build their evaluation skills and then move on to creating; the two occur congruently.

In order to better illustrate this, we will revisit the example of calculating the area of a floor covered by a carpet. When an individual creates a strategy for determining the area covered by non-traditionally shaped and overlapping carpets the process of developing a strategy will likely present numerous options. For example, the individual may decide to create imaginary lines that divide the carpets into

Category	Mathematical Connection	Mathematical Example
1. Creating	Joining or restructuring elements to form a new pattern, structure or idea (Anderson et. al, 2001) (i.e., formulate a new or unique strategy to solve a particular type of math problem)	For the same room described in the synthesis category, determine the best strategy given numerous appropriate options.
2. Evaluating	Ability to judge material based on criteria (i.e., evaluate a particular problem solving strategy)	For a room covered in non-traditional shaped carpets, argue a strategy to determine the area of floor covered.
3. Analyzing	Ability to separate material into component parts and show relationships between parts (Anderson et. al, 2001; Bloom, 1956) (i.e., describe a strategy for solving a math problem)	For a room covered with numerous rectangular carpets describe a strategy for determining the area of floor covered by all carpets.
4. Applying	Ability to carry out a procedure in new or real life situation (Anderson et. al, 2001) (i.e. implement a formula in a novel situation)	Find the area of floor covered by a carpet.
5. Understanding	Ability to construct meaning through various media (oral, written, etc.) and discuss ideas (Anderson et. al, 2001) (i.e. summarize information presented in a lesson)	Summarize in your own words or paraphrase the concept of area.
6. Remembering	Ability to recall previously learned material (Anderson et. al, 2001; Bloom, 1956)	Match the formula for calculating area with the appropriate shape.

Table 1
Connection between Bloom's Taxonomy and Mathematics

Students are considered to be engaging in "higher-order" thinking (Anderson et. al, 2001; Zheng, Lawhorn, Lumley, & Freeman, 2008) when they are performing tasks at Levels 4 through 6. This simplistic delineation of breaking the levels of Bloom's into higher and lower level thinking depending on the category is systematic and straightforward; however, it can get muddled in practical applications. Zheng et al. (2008) explain that the first four levels are hierarchical and must be addressed and achieved in order. The higher levels

regular shapes in order to calculate the area of shape and then add the areas of the shapes together to find the area of each carpet. To account for the overlap the individual may opt to use a similar approach to calculate the area of overlapping sections of carpet. At this point, a strategy has been developed. The individual realizes that the entire area covered by the carpets could be conceptualized in this same manner. Instead of viewing each carpet as a separate entity and finding the area of it, view all the carpets as one carpet. Now, the same process could be

used to divide the space using imaginary lines into regular shapes and finding the area covered. While creating their strategy they are inevitably evaluating numerous approaches that will all yield the correct answer.

From the standpoint of a teacher, the overlap of levels can cause some confusion and difficulty in designing tasks. For example, the categorization involved in defining these terms in hierarchical ways may lead to an over-simplification of the process of thinking and reasoning. It does, however, provide a compelling framework from which to work when thinking about implementation. Specifically, in examining these hierarchies, it is clear that attaining advanced levels of thinking in mathematics is necessary, but challenging for students. For teachers, this challenge is even greater, as they are tasked with designing lessons that elicit and teach these advanced thinking skills. For example, a useful, more general categorization that comes from evaluating these ways of thinking, at the extreme ends, is to define them as higher-order and lower-order.

Higher-order thinking (HOT) can further be defined as a process of taking "new information and information stored in memory and interrelat[ing] and/or rearrang[ing] and extend[ing] this information to achieve a purpose or find[ing] possible answers in perplexing situations" (Lewis & Smith, 1993, p. 136). As such, HOT occurs when information is synthesized, based on prior experience, in a way that is helpful in solving new problems. In contrast, lower-order thinking depends on stimulation from related ideas and experiences to recall information. In other words, lower-order thinking involves regurgitation and simple recall but does not involve the synthesis of information that is the hallmark of HOT. As these definitions imply, the ability to apply knowledge to new situations requires advanced thinking levels and HOT skills. This may be an easier idea to grapple with when designing instructional tasks, since the teacher can focus on HOT in general rather than one specific sub-category.

Critical thinking (CT) is another categorization of HOT that is defined by "reasonable, reflective thinking that is focused on deciding what to believe or do" (Ennis, 1987, p. 10). Beyer (1985) describes CT as "the assessing of the authenticity, accuracy, and/or worth of knowledge claims and arguments" (p. 276). Both Ennis and Beyer focus their definitions around the evaluation and reaction to external events or statements. Facione (1998) adds another dimension to these definitions describing- "critical thinking as an active process involving constructing arguments, not just elevating them" (p. 135); as such, he describes constructing arguments as problem solving. From Facione's definition it appears that problem solving fits within the construct of CT. All three of these scholars view CT as a reactive action, a problem or situation has presented itself and through CT the person will resolve it. Paul, Tavris, and Schoenfeld (1990) describe CT as "disciplined, self-directed thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thought" (p. 361). Though there are not glaring differences between these definitions, Ennis, Beyer, and Facione focus more heavily on the actions being taken to solve the problem, whereas Paul et al. support considering the appropriateness of those actions. Appropriateness is essential as it helps consider the long-term impact and diversity of perspectives that are present in any situation.

Generative thinking (GT) builds on components of critical and higher-order thinking. GT requires the use of prior information or experiences to create new knowledge, making it particularly relevant for algebra (and mathematics in general). One goal of GT is for students to make connections between distinct pieces of data or experiences and generate new knowledge, ways of thinking, or applications. GT should result in students creating new knowledge from the information provided. As such, GT is a form of HOT that we believe is necessary for HOT in algebra. Thus, GT is a useful construct in designing algebra instruction. Exploring the common definitions of these terms provides clarity around their use and distinguishes the thinking being asked of students through GT practices.

This leads us to another complicating aspect of this work- the lack of clarity in terms of vocabulary and definitions of terms. Ultimately, there is a great need for delineation between advanced thinking terms (such as CT, GT, and HOT so that teachers may more readily design tasks with clear intention and purpose.

Currently, many terms are used interchangeably, making it difficult for practitioners and researchers to navigate HOT ideas conceptually (Cuban, 1984). Teachers must understand these definitions, however, to design appropriate instruction, as they are prominent in the literature. This begs the question, how important is it to have these delimitations between terms? In theory and research it is clearly useful, but in practice is it more complicating than clarifying?

Higher-Order Thinking and Algebra Instruction

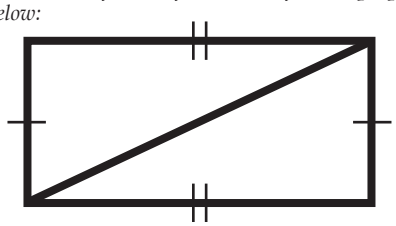
Multiple scholars outline various approaches to teaching thinking skills (Abrami et al., 2008; Ballew, 1967; Clark, 1991; Nicely, 1985). The challenge for algebra teachers, however, is that explicit connections between algebra and HOT are generally not made in the literature. Often, if a mathematics example is provided, it pertains to particular mathematical strands, namely geometry and pre-calculus, which are naturally conducive to HOT. Algebra, on the other hand, is typically regarded as a subject that is taught in a highly computational manner, requiring mostly lower level skills. As such, though it is well known that HOT skills are needed in algebra instruction, algebra is infrequently considered when describing lessons or pedagogical tools that elicit this type of thinking.

Additionally, the literature varies greatly in defining expectations related to the types of thinking that qualify as higher-order. Thompson's (2011) study highlights this crucial challenge by describing difficulties that arose in attempting to categorize and evaluate test questions on Algebra I EOC exams. Despite meticulous attempts to code questions in a standardized way according to levels of thinking (e.g., that a questions would fall into the knowledge level or the apply level), the same question could fall into multiple levels of thinking. The first example uses the 'additive inverse' concept. Calculating the additive inverse is not an mathematics standard, however, using the additive inverse to justify each step of solving a linear equation would fit within the Algebra TEKS 111.32.b.4.c that reads, "The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations" (TEA, 2012).

For example, one question asks, "What is the additive inverse of -1/10 ?" This question was classified in two ways. First, as a lower-level knowledge question, presumably because researchers see this as a recall fact based on a rule that students know from rote memory (i.e. to find the additive inverse, change the sign of the number). Second, the question was coded as a higher-level application question, presumably because researchers may have seen the need for students to not only know the rule, but be able to apply it to fractions. Both of these classifications are correct, but depend largely on interpretation and a student's prior knowledge. Similarly, another question that asked students to rewrite the equation 4x+5y+9=0 in slope-intercept form (TEKS 111.32.b.6) was classified as both applying and analyzing because the answer can be regurgitated without knowing why, or it can be solved with an appreciation for the process and the implications of the results.

Clearly, it is challenging to distinguish levels of thinking using algebraic problems as such levels are so dependent on the ways in which students are solving problems. Even if a classroom task is designed to elicit HOT, students may not engage in these thinking skills, depending on how they approach and solve the problem. In other words, problems that require HOT for one child might not for another due largely to prior knowledge. For example, consider the problems and responses below. This problem fits within the Algebra TEKS, 111.32.b.4, "The student connects algebraic and geometric representations of functions" (TEA, 2012).

Problem 1: Determine the formula for the area of a triangle given the information below:



Student 1	Student 2
I know the area of a rectangle is $l \times w$. Since the shaded triangle takes up half the area of the rectangle the area of the shaded triangle is ½ ($l \times w$).	I learned last year that the area of a triangle is ½ bh".

Table 2
Sample Student Responses for Problem 1

In Table 2, Student 1 displays the ability to evaluate all of the information present and generate new knowledge. As such, this response is an example of GT, a categorization of HOT. On the other hand, the question did not provide an opportunity for Student 2 to demonstrate GT because they had previously learned the formula to find area of a triangle and only needed to regurgitate the knowledge. This leads back to the question of the ability of standardized tests to measure HOT in algebra. In this example, though the intention may be to engage the student in a problem-solving task that generates a new idea, the student only needs to rely on memorized facts to answer the question correctly. Further, if a student does engage in a new way of solving this problem at an evaluative or creative level, but makes a mistake in generating the final formula or answer, the higher-order thinking is not rewarded, in fact, the creativity has hurt the student's score.

Problem 2: A rectangle has a length of 5x+7 and a width of 3x - 1. The perimeter of the rectangle is 85 units. Solve for x and explain your answer.

Student 1	Student 2
I know the area of a rectangle is $l \times w$, so I put $(5x + 7)(3x - 1) = 85$. Then, I solved for x and found $x = 2$.	The first thing I did was put a square around the expressions that contained an "x" and I circled the number (85). From class, I remember to set up my equation square times square = circle. Once I had my equation set up I solved for x and found $x = 2$.

Table 3
Sample Student Responses for Problem 2

In Table 3, Student 1 demonstrates an ability to synthesize numerous pieces of information in order to demonstrate a comprehensive solution. Student 2 also arrived at the correct answer, but it is difficult to tell if they truly understand what the problem is asking or if they have just memorized the tips and tricks from similar problems completed in class to solve this problem. In summary, in order for algebra problems to build students' GT skills teachers must be in tune with each student's prior knowledge and create experiences that allow students to push their abilities to generate new knowledge from existing knowledge. Again, this problem demonstrates potential problems with the measurement of HOT skills, especially through standardized questions.

Discussion and Conclusions

Ensuring students have enduring understanding of algebra will help them to be more successful regardless of their path, since algebra provides job opportunities or access to programs for jobs (Usiskin, 1995). Creating enduring understanding requires students to use HOT while connecting algebra and its application to the real world and future opportunities. There are difficulties in eliciting these types of thinking in practice; however, student prior knowledge can provide a lens from which teachers can create opportunities for meaningful GT (e.g., solving a multi-step equation uses balancing equations, various properties, order of operations, and fractions).

This work has implications for classroom practice at the K-12 and university levels. If HOT underlies student success in mathematics, strategies for engaging students in HOT must be incorporated more readily into the curriculum. Through embracing pedagogical practices that encourage HOT among students, we are not only better preparing them for future academic endeavors, but are generating more competent problem solvers who can impact society. In revisiting the literature, it is clear that the ability to make connections, justify solutions, and develop strategies for solving problems are more necessary and useful skills than simple recall and ability to apply a formula.

This discussion brings forth a more general and foundational set of questions related to current practices in curriculum design and implementation, and standardized testing practices. First, we as educators must re-examine our goals for mathematics education in Texas. Do we strive to produce (a) students who can memorize and recall facts, and at times use formulas to solve contrived "real world"

word problems, or (b) problem solvers who are able to plan, argue, justify, and persist in carrying out a mathematically sound solution to a contextualized problem? While we argue that outcome "b" is preferable, current practices in high-stakes standardized testing make it difficult to implement problem solving curricula in public schools. Because of the high-stakes nature of tests such as STAAR and EOC in Texas, teachers and administrators often feel pressure to "teach to the test", focusing on procedural skills and only the tested curriculum.

A second fundamental question relates to the relationship between HOT and any standardized test. While the intentions of standardized tests may be shifting towards evaluating problem solving skills, can these skills truly be tested by a multiple choice test? Looking back to Bloom's Taxonomy, it seems that mainly lower-order thinking skills (remembering, understanding, and applying) can be truly measured through these measures. Perhaps more individualized and varied types of assessments that require the generation of new ideas, evaluation and analysis of problem situations are more conducive to encouraging HOT in mathematics classrooms. Further, and because of these issues, we encourage algebra teachers to engage algebra students in problem solving situations that require HOT and result in deeper understandings of testable content; however, we understand the pressure to adhere to the dictated curricula. More discussions in the literature need to discuss this tension between HOT and testing cultures.

Likewise, we must examine our current teacher education programs. First, we should be engaging our pre-service teachers (PSTs) in HOT throughout their preparation, and we should engage them in discussions around instruction that elicits HOT among students. Further, PSTs need experience generating and evaluating lessons that are meant to focus on HOT skills, and should engage in analyzing student work that results from these types of lessons or problem solving sessions. As PST educators, we must also begin the challenging discussions around ways to navigate within the current system which is heavy in standardized testing, while still engaging students in problem solving and relevant, mathematically challenging tasks.

From a research perspective, additional work is needed that explores exemplary use of HOT in Algebra I classrooms. Most importantly, future studies should study the instructional methods and mindsets that enable exemplary teachers to engage students in HOT. For example, how do teachers elicit HOT in algebra classrooms and how do they know that they are doing so? Further, studies are needed to investigate the impact of the current educational environment on student thinking, and HOT in particular. For example, how does high stakes testing impact the ways in which students construct and retain knowledge? Lastly, more concrete research is needed to connect HOT, and potentially success rates on standardized tests, to future success in higher level mathematics. Researchers should prioritize student results in order to identify teachers that reach desired levels of thinking skills from students. The instructional practices and mindsets of teachers that reach HOT with students should be explored.

In conclusion, constructs such as Bloom's Taxonomy give educators an organizational scheme for structuring productive lessons that engage students in higher-order tasks. We argue that these types of tasks should be used more readily in Algebra I classrooms to better prepare students for future endeavors; however, our current test-heavy culture often discourages (or dictates against) teachers from embracing a more comprehensive curriculum that would allow for these types of mathematical explorations. More comprehensive, individualized, and varied assessments are needed to encourage these types of thought.

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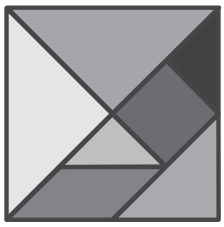
Tangram Scavenger Hunt

Last Issue's Winner

Congratulations to Julianne McCarty from Fisher Elementary School, Pasadena ISD. Julianne won a $100 NCTM gift certificate. Her name was drawn from the correct submissions to the Financial Literacy Scavenger Hunt in the Fall/Winter 2013 *Texas Mathematics Teacher*.

Tangram Scavenger Hunt



In this issue you need to find the answers to the following 10 questions using the seven pieces of a tangram. These answers may be found throughout this issue. Submit the question number and the page the answer appears on via email to Mary Alice Hatchett by September 15, 2014 at <*mahat@earthlink.net*>. All correct entries will be entered into a drawing for a $100 NCTM gift certificate. The winner will be notified by October 1, 2014.

1. If the small tangram triangle has a value of $250, then which tangram piece has a value of $500?
2. If the small tangram triangle has a value of $250, then which tangram piece has a value of $1000?
3. If the small tangram triangle has a value of $250, then which regular shaped tangram piece has a value of $500?
4. If the small tangram triangle has a value of $250, then which non-square quadrilateral tangram piece has a value of $500?
5. If the medium tangram triangle has a value of $1000, then which tangram piece has a value of $500?
6. If together the medium triangle, the two small triangles and the square have a value of $1, then what is the value of the large triangle tangram piece?
7. If together the medium triangle, the two small triangles and the square have a value of $1, then what is the value of the medium triangle tangram piece?
8. If together the medium triangle, the two small triangles and the square have a value of $1, then what is the value of the small triangle tangram piece?
9. If together the medium triangle, the two small triangles and the square have a value of $1, then what is the value of the regular rectangle tangram piece?
10. If together the medium triangle, the two small triangles and the square have a value of $1, then what is the total value of the tangram puzzle?

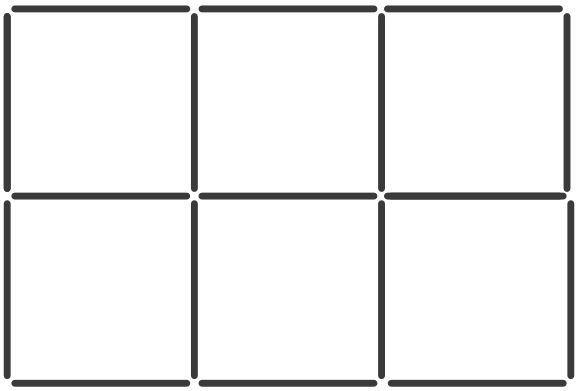
Puzzle Corner

Sticks #22 Puzzle

We are interested in how your students responded to this problem and how they explained or justified their reasoning. Please e-mail copies of your students' work, include your name, grade level, campus name and district name to Mary Alice Hatchett, Director of Publications, *Texas Mathematics Teacher*. Selected submissions will be acknowledged and published in subsequent issues.

Please prepare a sketch of your solution

Arrange 17 craft sticks to form 6 squares as shown..

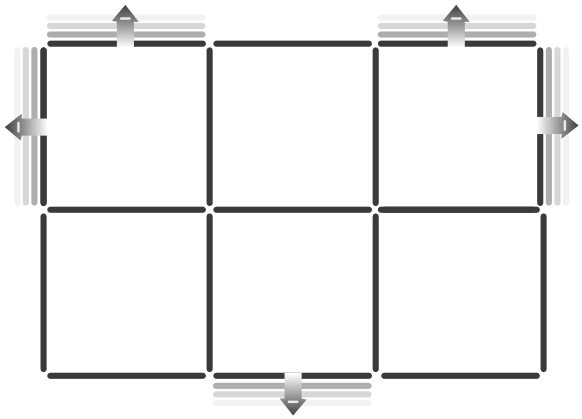


Puzzle: Now remove six sticks, leaving two similar squares.

Sticks #21 Answer

Arrange 17 craft sticks to form six squares, as previously shown. Move five sticks leaving three squares.

Shown is a diagram of **a solution.**

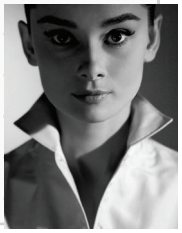


arrows indicate a moved or removed stick
plus-sign on a stick indicates new position

Quotes for Thought

"People, even more than things, have to be restored, renewed, revived, reclaimed, and redeemed; never throw out anyone."

Audrey Hepburn
Academy Award-winning actress, humanitarian
(1929 – 1993)



"If you're not prepared to be wrong, you'll never come up with anything original."

Sir Ken Robinson
Author, Speaker, Advisor on Education, Creativity & Innovation
(1950– present)

"A classroom cannot foster the development of autonomy in the intellectual realm while suppressing it in the social and moral realms."

Constance Kamii
Professor of Early Childhood Education, University of Alabama at Birmingham

On The Cover

Find the Mathematics… in a hillside star

Our cover picture this issue comes from Veronica Hernandez with Education Service Center (ESC) 19. The El Paso Star was originally built in 1940. It can be seen from 100 miles in the air and 30 miles on the ground. Read more about the history of this star of lights on El Paso's Mt. Franklin at:

<www.epelectric.com/about-el-paso-electric/el-pasos-star>.

Classroom questions for consideration:

1. Based on its number of sides, the outer border of the star forms what polygon?

2. Is the polygon identified in Q1 convex?

3. How does the El Paso star relate to a five-pointed star known as a pentagram (which can be formed by connecting alternate vertices of a pentagon)?

4. A pentagram can be created by connecting one vertex to another non-adjacent vertex and continuing this procedure until you reach the vertex you started with. Are all regular (i.e., equilateral and equiangular) star polygons "traceable" in this way?

5. Find at least one country whose flag has an element with a similar shape.

6. What is the measure of angle IAC? (hint: it is an interior angle of a regular pentagon)

7. What is the measure of angle AKC?

8. What is the measure of angle JAB?

9. What is the measure of angle BAC?

10. What is the measure of angle ABC?

11. What is the measure of angle ABK?

12. What kind of triangle is ABC?

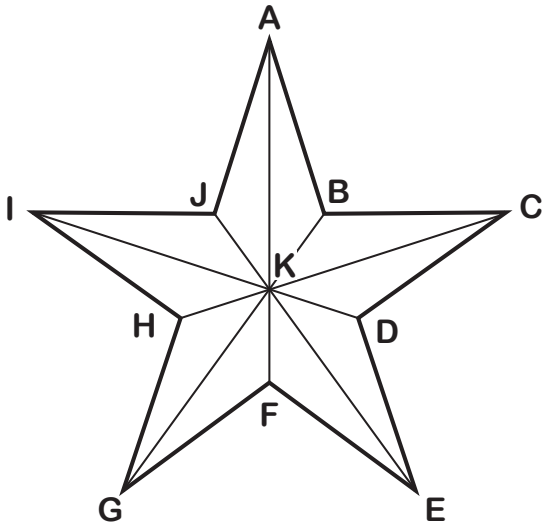
13. What kind of triangle is JAB?

14. What kind of quadrilateral is BCDK?

15. What kind of quadrilateral is ABCK?

16. (BONUS) What is the ratio of AE to AD? AD to DE? AB to BD?

For questions 6-16: Starting with the top start point as A, label the outer decagon's consecutive vertices A, B, C, D, E, ….J. And let K denote the point where the bisectors of the "star" angles (e.g., angles such as angle BCD and angle DEF) meet.



find answers on page 16

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<Lesser@utep.edu>

On the Cover: Classroom Question Answers

You will find the original questions on page 15.

1. Based on its number of sides, the outer border of the star forms what polygon?

   A decagon

2. Is the polygon identified in Q1 convex?

   No, it is concave.

3. How does the El Paso star relate to a five-pointed star known as a pentagram (which can be formed by connecting alternate vertices of a pentagon)?

   Answers will vary.

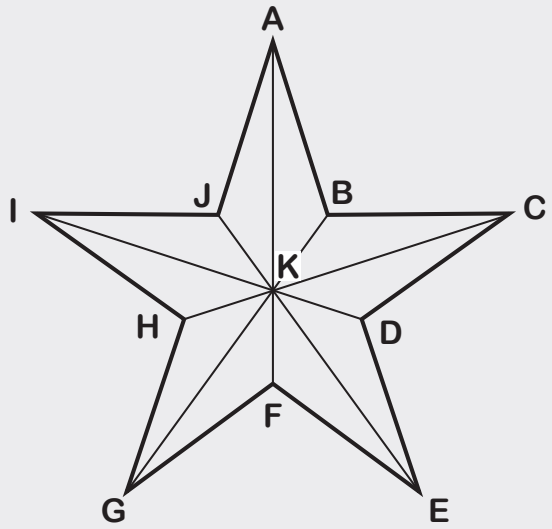
4. A pentagram can be created by connecting one vertex to another non-adjacent vertex and continuing this procedure until you reach the vertex you started with. Are all regular (i.e., equilateral and equiangular) star polygons "traceable" in this way?

   Yes.

5. Find at least one country whose flag has an element with a similar shape.

   Morocco, Ethiopia, Algeria, Ghana, Chile, China, Liberia, Grenada, Libya, Pakistan, Panama, North Korea, New Zealand, Micronesia, Turkey, Vietnam, Somalia, Tunisia.

For questions 6-16: Starting with the top start point as A, label the outer decagon's consecutive vertices A, B, C, D, E, ….J. And let K denote the point where the bisectors of the "star" angles (e.g., angles such as ∠BCD and ∠DEF) meet.



6. What is the measure of angle IAC? (hint: it is an interior angle of a regular pentagon)

   180(5-2)/5 = 108 degrees
   (students too young to do this calculation could at least classify this angle as an obtuse angle)

7. What is the measure of angle AKC?

   360/5 = 72 degrees
   (students too young to do this calculation could at least classify this angle as an acute angle)

8. What is the measure of angle JAB?

   36 degrees. It would be an inscribed angle in a circle, it would cut off an arc 1/5 of the circumference. So the arc would be 72 degrees and an inscribed angle is half of the arc it intercepts.

9. What is the measure of angle BAC?

   36 degrees. Since $m\angle IAC = 108^o$ and $m\angle JAB = 36^o$, $m\angle BAC$ must be half of the difference.

10. What is the measure of angle ABC?

    180 – 36 – 36 = 108 degrees (students too young to do this calculation could at least classify this angle as an obtuse angle)

11. What is the measure of angle ABK?

    (360 – 108)/2 = 126 degrees

12. What kind of triangle is ABC?

    Isosceles obtuse triangle

13. What kind of triangle is JAB?

    Isosceles acute triangle

14. What kind of quadrilateral is BCDK?

    Convex kite (two pairs of adjacent congruent sides)

15. What kind of quadrilateral is ABCK?

    A chevron, or nonconvex kite

16. (BONUS) What is the ratio of AE to AD? AD to DE? AB to BD?

    Golden ratio (1.1618)

Lessons Learned from TEA's "Introduction to the Revised Mathematics TEKS"

I was given the opportunity by my district to attend TEA's "Introduction to the Revised Mathematics TEKS" trainer-of-trainers and later present the professional development to teachers in my region and in my school district. As I facilitated the professional development modules, several recurring questions were voiced by teachers.

One question teachers had as they examined the Side-by-Side TEKS Comparison document was, "What does this mean?" The new expectations for data analysis presented some teachers with terminology they were not familiar with. The fraction terminology in Grades 2-4 caused teachers to pause and question their own understanding of fractions. Several things helped teachers to understand these terms and concepts. We did workstation activities that helped teachers see the purpose of various types of graphs. Once they explored the various graphs, they were better able to understand the terminology. To clarify the new fraction terminology, we went "back to the basics" of drawing pictures and using manipulatives to model the language of the student expectations. Teachers, who feared the new expectations were too difficult for their students, were able to see how the new TEKS could be accessible for their students if they used the same instructional methods in their classrooms.

Communicating about math strategies was another aspect of the revised mathematics TEKS that generated several questions from teachers. Teachers had questions about how these expectations could be accomplished with their students. In order to ensure that our students not only have the skills they need but understand how to apply them, they should be able to write and talk about their strategies. My district has worked on incorporating "math talks" and academic language builders for English Language Learners and struggling students into instruction. With the implementation of the new TEKS, our teachers are starting to see the full benefit of these instructional strategies. By asking students to communicate about their strategies, teachers can clearly see their misconceptions, and students can learn from their mistakes and the possible mistakes of their classmates. If teachers incorporate similar strategies with their students, this will assist in making the revised mathematics TEKS accessible to all students.

After I facilitated the professional development at my campus, I wondered, "What can I do as the math instructional coach for my teachers to make this a smooth transition?" My teachers might need me to model lessons showing students how to communicate about their math strategies and incorporate the process standards into instruction. I will need to work on my skills with conducting "math talks" to improve our students' mental math strategies, challenging students with rigorous problems, and incorporating writing with math. I will need to provide staff development on incorporating communication in the math classroom, fraction concepts, and possibly data analysis as well. Most of all, I will need to understand and prepare myself for the new math TEKS so I can be an asset to my campus teachers and ultimately our students.

Lara Roberts • teacher
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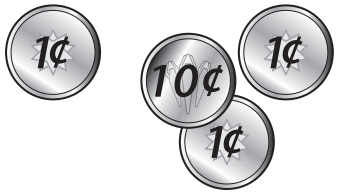

Application Information

2015-16 Mathematics Preservice Teacher Scholarship

There are ten $2000 scholarships available for 2015-16. Any student attending a Texas college or university - public or private - and who plans on student teaching during the 2015-16 school year in order to pursue teacher certification at the elementary, middle or secondary level with a specialization or teaching field in mathematics is eligible to apply. A GPA of 3.0 overall and 3.25 in all courses that apply to the degree (or certification) is required. Look for the scholarship application online at *<www.tctmonline.org>*. The application deadline is May 1, 2015. Winners will be announced in July 2015.

TCTM 2015 Grant

This grant is for K-12 educators, university faculty and NCTM affiliate groups in Texas. Please note, pre-service teachers are not included as they can apply for the Mathematics Preservice Teacher Scholarship. The grant can be awarded to an individual, a group of teachers or to another NCTM or NCSM affiliate organization, if they are in Texas. Grant requests up to $1,200 will be accepted.

Uses include (1) improving mathematics classroom(s), or (2) helping your school achieve its goals related to mathematics, or (3) promoting mathematics teaching and learning, or (4) improving your ability to teach mathematics.

The online application may be found at *<www.tctmonline.org>*. The application deadline is November 30, 2014. Awardees will be notified by January 31, 2015.

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TCTM Communications

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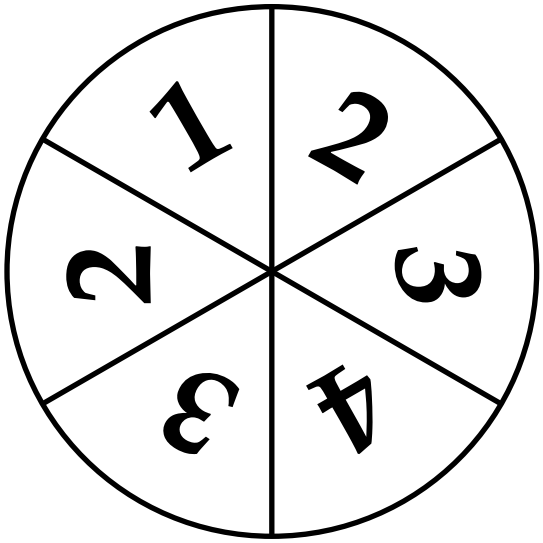
Tangram Geometry Spin: A Student Activity

Materials: 1 set of tangrams for each player
1 spinner (with bobby pin) per group

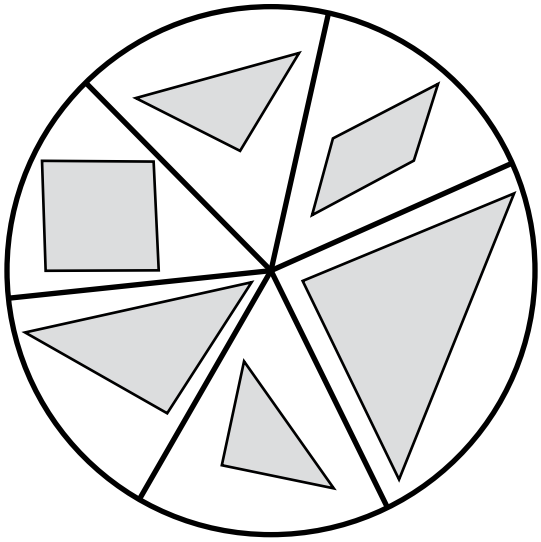
 # players : 2 -4

Directions:

1. On each round of play, a player spins the shape spinner to determine the shape to be used that round. Then, each player in turn spins a number and uses that number of tangram pieces to build a similar shape to the selected shape. A player's score for the round is the number spun only if he/she is able to build the shape.
2. If a '1' is spun, then the player must spin again and use 'one more' than the number of pieces spun on the second spin.
3. A game can end after any round. Players total their scores. The winner is the player with the highest total.



Hold a pencil at the center of the spinner with one hand while spinning a bobby pin with the other.



ME by the SEa 2014 Conference

Mary Alice Hatchett, President of TCTM, at the 2014 ME by the SEa Conference hosted at Texas A&M University – Corpus Christi

Recommended Software

Reflex® Making Fact Fluency Fun!

Is fact fluency a challenge for your students? Fact fluency is one of the biggest challenges I have faced as a math teacher. A lack of fact fluency significantly hampers students' ability to master more complex mathematics curriculum. Knowing that this was a barrier that needed to be addressed immediately, I began to consider what strategy I should use to help my students improve their mastery of math facts. Fortunately, my district had purchased a subscription to Reflex®. Reflex® is a game based, online program that is adaptive and individualized and most importantly for the student-it's FUN! Since it is an online program, students can even access it at home for additional practice. Reflex® also offers powerful, data driven reporting that can be broken down by teacher, by class and even by individual student. After researching this program, reading case studies about its effectiveness, and so many inspiring success stories, I thought it might offer a valuable experience for my students.

Who are my students?

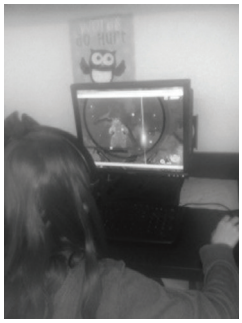
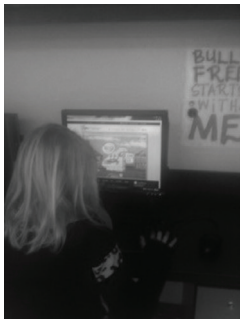
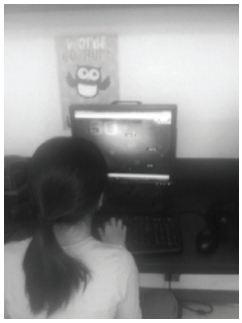
This year, I teach three classes of 4th grade math with a total of 51 students. Of those 51 students, seven are at-risk and one is limited English proficient. Overall, my students are very eager to learn and are open to try new things. However, there are several that started the school year with a very low confidence in their ability to master math concepts.

What exactly is Reflex®? How does it work?

Reflex® helps students of all ability levels to develop fluency with their basic facts in addition, subtraction, multiplication and division. Any student who understands the basic concepts behind mathematical operations is ready to use Reflex®. Students in 2nd-6th grade would benefit the most from this program, although younger and or older students could benefit as well based on their individual needs and/or abilities. The system requirements to operate Reflex® are: Flash Player-version 10.1 or higher, a web browser, sound capability and a display size of 1024 x 768 or higher. Reflex® uses a fact family approach that reinforces important mathematical concepts such as the commutative property and the relationship between the operations. When students understand the conceptual connections between facts, their progress to automaticity (automatic response pattern or habit) is accelerated.

How was Reflex® implemented?

In September, I implemented Reflex® in my classroom. To get started, I simply logged on to www.reflexmath.com and entered my students. The website offers a teacher's guide that provides step-by step assistance with this process. Since I only have three student computers in my classroom, I utilized our grade level computer lab to pilot Reflex® with my students. The various sounds associated with Reflex® can be distracting so it works best when each student has an individual set of headphones. When students log on for the first time, Crabby (a friendly crab who will guide students through the program) will introduce himself and walk students through the creation of their avatar. After students have created their avatar, Crabby will take them to Crabby's Fact Fair. Every Reflex® session will begin with Crabby's Fact Fair. This is a fun assessment that allows students to play carnival games by answering math facts. At the conclusion of Crabby's Fact Fair, students travel to Reflex® Island and are able to choose which game they would like to play. They will choose a game by clicking on that game's tree house. Coach Penny will greet them outside of the game to get them ready to play! Coach Penny's teaching will vary from day to day depending on the student's individual needs. Students will then complete Coach Penny's Picture Puzzle which is a review of what the student learned that day. Now it's time for Fluency Games! This is where students will apply what they learned from Coach Penny and answer the facts repeatedly. When students first begin using Reflex®, only two games are available for them to choose from. Once a student has answered a certain number of facts on a given day, a green light will light up at the upper right corner of the screen. Students can typically accomplish this in approximately 15 minutes of concentrated use. As they move through the program and meet the Green-Light usage requirement, new games will be unlocked. My students work in Reflex® three to four days a week for approximately 15 minutes a day. Reflex® could also be implemented in math intervention or be used in a math facts station in your classroom.

How is student progress rewarded within Reflex®?

Student progress is rewarded within Reflex® in a variety of ways. One way that students are rewarded is by earning tokens in Reflex®. Tokens can be earned in Crabby's Fact Fair, Coaching with Coach Penny and in the Fluency Games. Students can use their tokens to buy items from the Reflex® Store. However, students cannot access the Reflex® Store on Reflex® Island until they have met the daily usage requirement. The Progress Tree is another way that students are rewarded in the program. During the third Reflex® session, students plant an acorn on Reflex® Island. As a student's fluency grows, so does their tree. The reporting system in Reflex® also rewards students by tracking milestones. The two types of milestones that are tracked are effort based (ex. 1,000 Facts Solved) and fluency progress (ex. 50 New Fluent Facts). When these milestones are achieved, a certificate is generated and can be printed from Reflex®.

What reports are available in Reflex®?

There are several reports Reflex® generates to help monitor students' progress with fluency growth. The School Year Overview Report includes a "fluency meter" that shows how fluent students are at any given time while using the program. In the Fact Detail report, you can see which specific facts a student has or has not mastered. It is available in a fact family pyramid view and also as a basic fact grid view. Fluency growth is measured in Reflex®'s Fluency Growth report.

Did Reflex® work for me? Was there a significant increase in fact fluency?

When I piloted Reflex® in September, the average starting fluency of my students was 14% fact fluency. The multiplication and division assignments within Reflex® assess students on their mastery of the 325 multiplication and division facts 0-12. We used the program three to five days a week for 15 minutes a day. Some students also used the program during tutorials or at home. By January, the average fluency of my students is 61%. Overall, my students had fluency gain of 8,310 facts and an average gain per student of 154 facts. Additionally, when my students were assessed on Multiplication, 93% of them were successful on their unit assessment. On the Division unit assessment, 100% of my students were successful. Based on these results, I can say that Reflex® was an effective tool for building fact fluency for my students.

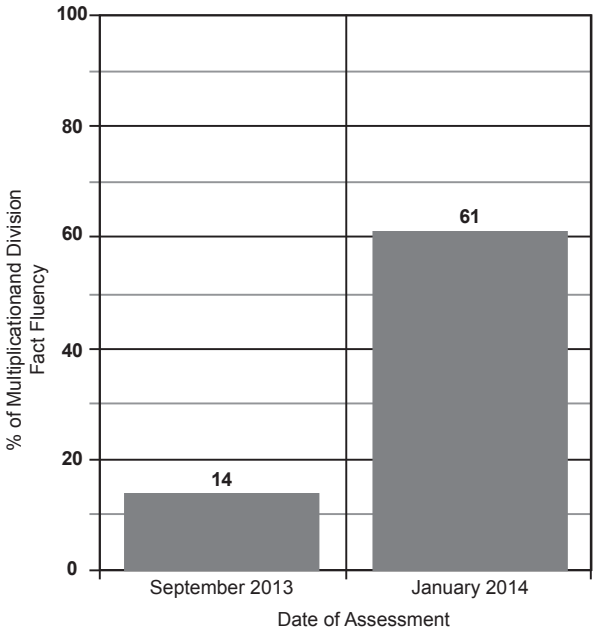


Figure 1. Fact Fluency Growth Using Reflex® (*n*=51)

What do students think of Reflex®?

Students are motivated by using Reflex®! Their confidence has greatly improved and they are proud of all of the milestones they have achieved. One student said, "Reflex® is one of the best math sites that I have learned on. I feel like I am doing the best that I can do. It is fun because I can play games while learning how to better multiply and divide. I feel more confident with my math now that I am using Reflex®." Another student said, "Reflex® is helpful because you are able to learn to do multiplication and division more quickly. You can also keep track of how you are doing by looking at your Progress Tree. In addition to that, you are entertained and having fun while learning." It's a great feeling when you know your students are learning and they are having fun doing it. This is another one of my favorite student quotes, "Reflex® is fun because you can play games and learn your multiplication facts at the same time. My favorite game is Ninja to the Stars. I feel very confident on some facts because Reflex® has taught me the facts. On Reflex®, you can also get tokens by answering facts and buy stuff at the Reflex® store. Reflex® is a good way to learn without ever getting bored!" My students thoroughly enjoy spending time working in Reflex®. In fact, they often ask to come to the math classroom during their elective times (Art, Music or Technology)!

Would I recommend Reflex® to other math teachers?

Fact fluency is definitely a challenge that math teachers have to overcome before any complex mathematical concepts can be taught. I now have confidence in my ability to get my students where they need to be with fact fluency with the help of Reflex®. I would highly recommend this program to anyone. I truly have seen substantial growth in my own students and I am confident any student group could also experience this type of improvement! Other programs that promote fact fluency are FASTT Math® and Math Fact Fluency™.

Reflex® offers a Teacher Guide on their website (www.reflexmath.com) that will give you all the information you need to get started using Reflex® in your own classroom!

Ashley Brittain • Teacher
China Springs ISD • <ABrittain@chinaspringisd.net>

Recommended Reading

What's MATH got to do with it?

Penguin Books
ISBN 978-0-670-01952-6

"What's MATH got to do with it? How parents and teachers can help children learn to love their least favorite subject" by Jo Boaler, Professor of Mathematics Education at Stanford University provides a great way to think about education in general and math in particular. The main focus of the book is how to engage students in interesting and fun mathematics problem solving. Several of the chapters are devoted to the authors views about the political ideas behind the 'math wars' , so you might want to read chapters 6-8 first to gain an insight to Dr. Boaler's philosophy about teaching math.

The 5 Elements of Effective Thinking

Princeton University Press
ISBN 978-0-691-15666-8

"The 5 Elements of Effective Thinking" by Edward B. Burger, President of Southwestern University in Georgetown, Texas and Michael Starbird, Distinguished Teaching Professor of Mathematics at The University of Texas at Austin is a fun book with great tips on how to improve overall thinking skills. . . . intended to help teachers and students employ the techniques in order to earn better grades and become better thinkers in math as well as life in general.

Every math teacher will count both of these books as inspiring resources.

Mary Alice Hatchett • <mahat@earthlink.net>
Independent K-12 Mathematics Consultant • Georgetown, TX

TEA Talks

The Texas Education Agency (TEA) has several webpages important for mathematics educators.

Curriculum

To find out more about the Texas Essential Knowledge and Skills (TEKS) and resources to support their implementation, see the TEA website at *<www.tea.state.tx.us>*. On the left, click on Curriculum and scroll down to the quick links (different from the home page quick links) to Curriculum Division. On this page, scroll down to the Curriculum Newsletters to download a pdf of the most current information about the standards and professional development or click on the link to Mathematics for more subject-specific information. For additional information, contact: James Slack, Statewide Mathematics Coordinator at (512)463-9581 or *<james.slack@tea.state.tx.us>*.

Assessment

To find out more about the State of Texas Assessments of Academic Readiness (STAAR) and changes resulting from the new mathematics TEKS, see *<www.tea.state.tx.us>*. On the left, click on Testing and Accountability and scroll down to the quick links to STAAR. Information about standard setting, timelines, blueprints and more can be found on this page. For additional information, contact: Student Assessment Division at (512) 463-9536 or *<student.assessment@tea.state.tx.us>*.

Legislative Update and Advocacy

Texas Legislature

House Bill 5, passed in the 2013 legislative session, changed our testing requirements and graduation plans. With the 2015 session looming, House Bill 5 has resulted in more discussions at the legislature about it's implementation and the need to revise this legislation based on educator and parental feedback. If you have feedback, please contact your legislator. The Senate and House websites provide easy access to contact information for all elected officials.

State Board of Education (SBOE)

At the July 2014 meeting of the SBOE, Dr. Shirley Dickson presented information to board members about the process of writing state curriculum standards. The next round of curriculum revisions of the Texas Essential Knowledge and Skills (TEKS) will begin in Spring 2015 on the English Language Arts/Reading (ELA/R) standards.

Currently the Career and Technical Education (CTE) standards are under review. Many mathematics educators were invited to participate in the process.

This year is the first year of implementation of the mathematics standards adopted in April of 2012. The 2014-15 school year requires the implementation of the K-8 mathematics TEKS and the 2015-16 school year requires the implementation of the high school mathematics TEKS.

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Independent K-12 Mathematics and Research Consultant Austin, TX

"Peacewise"-Defined Graph: A Student Activity

Step 1: ZOOM → ZSquare

Step 2: 2^{nd} CATALOG → AxesOff → ENTER

Step 3: press Y= then enter these three functions:

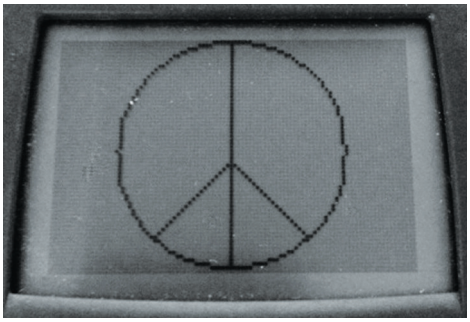
Y1 = sqrt($100 - x^2$)

Y2 = - sqrt ($100 - x^2$)

Y3 = (-abs(x) – 1) / (($-6.5534 < x$) and ($x < 6.5534$))

Step 4: 2^{nd} → DRAW → Vertical → 0 → ENTER

Step 5: GRAPH



notes:

- the square root key is above the x^2 key;
- the absolute value function is under the MATH → NUM menu;
- the "division" symbol in Y3 is actually being used to indicate a domain condition;
- the inequality signs are obtained from 2^{nd} → MATH → TEST;
- the "and" is obtained from 2^{nd} → MATH → LOGIC
- have Algebra II students verify that -6.35534 comes from the negative root of $2x^2 - 2x - 99 = 0$, an equation which comes from solving the system of equations $x^2 + y^2 = 100$ and $y = x - 1$;
- have Algebra II students verify that 6.35534 comes from the positive root of $2x^2 + 2x - 99 = 0$, an equation which comes from solving the system of equations $x^2 + y^2 = 100$ and $y = -x - 1$;

Larry Lesser • Mathematics Education Professor
The University of Texas at El Paso • <Lesser@utep.edu>

(inspired by a comment by Judah Lesser, a student at El Paso's Coronado High School)

How do student groups compare to the nation in performance at or above Proficient?

Table 1
SAT Performance, by Race/Ethnicity and Gender, Texas and the United States, Class of 2011

	Average score							
	Critical Reading (CR)		Mathematics		CR and math combined		Writing	
Group	Texas	U.S.	Texas	U.S.	Texas	U.S.	Texas	U.S.
2011								
African American	423	428	438	427	861	855	412	417
American Indian	500	484	509	488	1009	972	474	465
Asian/Pacific Islander	522	517	583	595	1105	1112	521	528
Hispanic	439	451	467	463	906	914	430	444
White	522	528	540	535	1062	1063	504	516
Female	476	495	489	500	965	995	472	496
Male	482	500	516	531	998	1031	458	482
All examinees	479	497	502	514	981	1011	465	489

Note. Data are based on public and nonpublic school examinees.
[a]Not available. The SAT writing examination was introduced in 2006.

Table 2
ACT Performance, by Race/Ethnicity and Gender, Texas and the United States, Class of 2011

	Average score									
	English		Mathematics		Reading		Science		Composite	
Group	Texas	U.S.	Texas	U.S.	Texas	U.S.	Texas	U.S.	Texas	U.S.
2011										
African American	16.0	15.9	18.3	17.2	17.2	17.0	17.8	17.1	17.5	17.0
American Indian	20.5	17.5	22.1	18.6	22.0	19.1	21.7	18.9	21.7	18.6
Asian	23.8	22.8	26.6	25.1	24.2	22.9	24.2	23.1	24.8	23.6
Hispanic	16.8	17.6	19.5	19.2	18.3	18.9	18.9	18.8	18.5	18.7
Pacific Islander	18.4	18.6	20.6	19.9	19.5	19.4	20.2	19.5	19.7	19.5
White	22.5	22.1	23.5	22.1	23.3	22.7	22.8	22.1	23.2	22.4
Multiracial	20.9	20.7	22.0	20.7	22.0	21.6	21.7	20.9	21.8	21.1
Female	19.9	20.9	21.0	20.6	20.8	21.4	20.4	20.5	20.6	21.0
Male	19.3	20.2	22.1	21.6	20.6	21.1	21.3	21.4	21.0	21.2
All examinees	19.6	20.6	21.5	21.1	20.7	21.3	20.8	20.9	20.8	21.1

Note. Data are based on public and nonpublic school examinees.

Source: Texas Education Agency (2014). *College admissions testing of graduating seniors in Texas and the United States, class of 2011* (Document No. GE14 601 03). Austin, TX: Author

2014 TCTM Leadership Award

Caren Sorrells

This year, TCTM is pleased to honor **Caren Sorrells** for her leadership across the state of Texas.

Caren Sorrells is an independent mathematics consultant, recently retired from Birdville ISD where she served as the Mathematics Coordinator. Caren's 38 years of experience spanned classroom experience in grades 3-12 as well as K-12 experience as a district mathematics coordinator for both Keller ISD and Birdville ISD.

She began her journey in education in Florida where she taught elementary through high school mathematics. She was involved at all of the campuses in which she was privileged to be a staff member. She was Student Council sponsor, Key Club sponsor and Math Team Coach as well as balancing her career by raising two sons and being active at her church.

Caren and her husband Rick moved to Michigan due to a transfer in Rick's job. Caren had the opportunity to teach students from a different perspective – that of a substitute teacher. It was a year of many new experiences. Before arriving in Dallas, Caren taught 6th grade students in Michigan.

As a Texas public school teacher Caren taught in Dallas ISD, Garland ISD and Keller ISD where she also became the first mathematics Coordinator for the Keller district. For the 3 years Caren served as the Keller ISD Math Coordinator she paved the road for professional learning for teachers as well as being part of a collaborative of districts to provide summer staff development of researched based strategies in the math content.

Caren moved to Birdville ISD in 1999 where she served as the K-12 and then the K-5 Mathematics Coordinator for 15 years. She became a TexTEAMS (Texas Teachers Empowered for Achievement in Math and Science) trainer for the elementary and middle school professional development trainings as well as several of the high school professional development trainings.

She facilitated the Dallas-Ft. Worth area supervisors McMath meetings for several years as she served as the Treasurer for the Texas Association of Supervisors of Mathematics (TASM) from 2002-2004. Caren was elected as President of TASM for two 2-year terms from 2009-2013. During her terms of office Caren was privileged to lead the state mathematical leaders through an arduous process of writing, editing and adopting the 2012 TEKS. She was able, with assistance from expert TASM mathematics leaders, to testify and then work with the SBOE in revising and adopting the 2012 TEKS. In 2012 Caren was awarded the Tommy Eads-TASM Leadership Award.

Caren received her Bachelor's degree in elementary education from Florida State University and gained her Master's degree in Educational Management from The University of North Texas. She continues her mathematics journey as she consults with districts to give support in curriculum and instruction.

2014 TCTM Grant Recipients

Ten TCTM Grants were awarded this year by TCTM. We would like to extend our congratulations to each of the following recipients. All recipients created a proposal for how they would use funds awarded to them. Uses include (1) improving mathematics classroom(s), or (2) helping your school achieve its goals related to mathematics, or (3) promoting mathematics teaching and learning, or (4) improving your ability to teach mathematics. For more information on the process, requirements, and deadlines for the TCTM Grant, please visit our TCTM Grant Application page online at *<http://www.tctmonline.org/grant_apply.html>*

Judy K. Cryer, San Angelo	**Ollie A. Hart,** Abernathy
KaSai Un, Dallas	**Rachel M. Roepke,** Austin
Kim Keebaugh, McAllen	**Renee R. Lee,** Cedar Park
Maria G. Centeno, El Paso	**Sandi Cooper,** Waco
Melinda G. Kniseley, Spring Branch	**Wendy A. Smith**, Nevada

2014-15 Mathematics Preservice Teacher Scholarship Awardees

Ten Texas students were awarded the $2000 TCTM Mathematics Preservice Teacher Scholarship for 2014-15. We would like to extend our congratulations to each of the following recipients. Each scholarship awardee attends a Texas college or university - public or private - and works as a student teacher in order to pursue teacher certification at the elementary, middle or secondary level with a specialization or teaching field in mathematics.

Kylie Terry, Baylor University	**Michael Norris,** University of Houston-Victoria
Niki Kratzer, Baylor University	**Amy Lopez,** University of Houston-Victoria
Erin Bremer, Stephen F. Austin University	**Deisy Gonzales,** Univeristy of Houston
Rebecca Sheckles, Texas Christian University	**Katie Ward,** The University of Texas at Dallas
Catherine Davison, Trinity University	**Sharna Polk,** The University of Texas at Tyler

2014 E. Glenadine Gibb Achievement Award

Noemi Rodriguez-Lopez

TCTM is pleased to honor **Noemi Rodriguez-Lopez** for her leadership at both the state and national levels.

Noemi R. Lopez retired in October 2013 after 39 years in education from Harris County Department of Education in Houston, Texas. Her career began with Corpus Christi ISD where she worked for eight years. While at CCISD, she worked as a middle school math teacher at Haas Middle School and shortly afterwards, moved to Miller High School. She served as department head in both schools. She also served as a mathematics specialist to pilot math lab settings in one junior high and two high schools to master the TABS/TAAS test. She later was recruited to serve as the mathematics specialist at the Region 2 Education Service Center in Corpus Christi. During her 12 years at ESC 2, she provided mathematics training to the area 42 school districts, coordinated the EESA Title II Math/Science Cooperative, coordinated the MATHCOUNTS Program at the regional level and collaborated with the mathematics professors at Texas A&M- Kingsville as part of the EEESA Title II High Education Grant Program. She again was recruited to join Harris County Department of Education in 1994 in Houston, Tx. During the first 10 years at HCDE, she served as K-12 mathematics specialist, Director for the Center of Professional Development and Instructional Support as well as the associate director of the Houston Consortium of Urban Professional Development Technology Center. Her first retirement was in 2004. She came back to HCDE working an additional 9 years as marketing manager and client development officer. She also served as an interim mathematics specialist during 2009-2010 school year.

During her educational career, Ms. Lopez served in numerous leadership committees at the local, state , regional and national level. She was president of the Coastal Bend Council of Teachers of Mathematics in Corpus Christi. At the State level she served in TEA's TABS, TAAS and TEKS state testing committees in addition to serving on the State Board of Educator Certification for secondary mathematics. At the regional level she served in various committees for the Southwest Educational Laboratory. For 10 years she represented Texas in SCIMAST-a 5 state consortium for Math and Science. She also served in the 21st Century After School Training Toolkit and Leading Mathematics into the 21st Century committee. At the national level she served in three major committees for the National Council of Teachers of Mathematics- the Regional Mathematics Conference, Comprehensive Mathematics Education for Every Child and Reaching All Learners. She also was an elected board member to the national organization of TODOS: Mathematics for All and an appointed board member to the National Council of Supervisors of Mathematics.

Noemi also is an author of *¿Como se Dice? How Do You Say It?*, a manual of 750 mathematics words for teachers and students. She has had several articles written for NCSM and most recently will also be featured in the California Math Council journal, *The ComMuniCator*.

Her educational background consists of a BS in secondary education with an emphasis in mathematics and a M.S. in Curriculum and Instruction with a minor in mathematics from Texas A&I-Kingsville (now Texas A&M, Kingsville). She went on to get a certification in mid-management.

There is a saying that, "once a teacher… is always a teacher. This is so true of Noemi. Yet, after her second retirement she finds herself being a part- time GED instructor in Houston and still teaching mathematics! She enjoys being a mom to her two children- one working with an investment bank and the other a 2nd Lieutenant in the Air Force.

PAEMST

Presidential Awards for Excellence in Mathematics and Science Teaching

The **Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)** are the nation's highest honors for teachers of mathematics and science. Awardees serve as models for their colleagues, inspiration to their communities, and leaders in the improvement of mathematics and science education. Nominations for mathematics and science teachers of grades 7-12 will open in Fall of 2014. Please see <*www.paemst.org*>.

A state panel of master teachers, specialists, and administrators review the applications and choose the outstanding mathematics teachers for the National Science Foundation to consider for state finalist status. After an initial selection process at the state level, a national panel of distinguished scientists, mathematicians, and educators recommends a finalist to receive the national award. If chosen as a national winner, the state finalist will receive $10,000 and an all expense paid trip for two to Washington D.C. for ceremonies that include recognition from the president of the United States at the Capitol.

In the fall, outstanding certified mathematics and science teachers in grades 7-12, with five years or more of teaching experience, will be eligible to apply. If you would like to nominate an outstanding mathematics or science teacher, nomination forms and applications will be available at the website above in the fall.

Compatibility of Numbers: Making Mathematics User Friendly

A recent cartoon spoke to me about a major problem in math education. It showed a cute toddler with his mouth shut tight in concentration, a look of determination on his face, and his hand clenched into a fist. The caption above the toddler said, "Solves math problem," and below the image stated, "Doesn't understand anything about it."

That's the trouble! Kids are being taught "to solve the problem" by following rigidly prescribed steps, but they don't understand the mathematical reasoning that goes into solving the problem. As a K-6 math coach, I want to help teachers promote mathematical reasoning. Estimation is my favorite way. It can remove the rigidity of computation. When properly taught, estimation can help kids think like mathematicians. It can make computation more inviting, fun, and fluid for the mathematician that dwells within each of us.

Using compatible numbers in estimation

The new curriculum standards encourage the integration of estimation in all computational areas of mathematics, using both rounding and compatible numbers. So, what are compatible numbers? Does the term mean that these numbers get along or have a special relationship with one another? It is something like that.

Suppose you are thinking about compatible numbers in terms of coins. Then the denominations of the penny, nickel, dime quarter, and half dollar (1, 5, 10, 25, and 50) have a special relationship with each other since they are the elements of monetary computation. They are landmark (benchmark) numbers.

Suppose you are thinking about compatible numbers in terms of addition. If you are adding a column of figures that includes 5, 6, 4, and 5, what do you do? Most likely, you put the two 5s together as 10, and you put the 6 and 4 together as another 10. You probably do this automatically--because you have mathematical sense about the compatible numbers that add up to 10.

Compatible Numbers

Students need to develop this kind of number sense. They can practice applying it in estimation (Kilpatrick, Swafford, & Findell, 2001). Compatible numbers are uniquely envisioned in each child's mind. They are derived based on that child's familiarity with computation and internal number sense. Developing student's understanding of compatible numbers can lead them toward a deeper, more reflective form of estimation. It focuses on combinations of numbers that are familiar to each individual student.

Let me share a discussion between a teacher and a student as she develops his understanding of using compatible numbers when estimating a sum.

Teacher
Juan could you estimate the sum of 37 + 42?

Juan
37 rounds to 40, and 43 rounds to 40. So 40 + 40 = 80

Teacher
Juan you did an excellent job estimating by rounding. But can you think of another way to combine 37and 42?

Juan
I don't know any other way to round numbers.

Teacher
Remember using ten frames to make combinations of ten? What two numbers can you combine that composes the number ten?

Juan
I know lots of combinations: 9 + 1 = 10 and 8 + 2 = 10.

Teacher
Excellent! Look at the digits in the one's place in the equation you estimated. 37 + 42. Look at the 7 and the 2. Could you change one of those digits so that the sum will equal 10?

Juan
Well, I can change 7 to 8. Then 8 + 2 = 10.

Teacher
Juan, do you see that you have now come up with another way to estimate 37 + 42?

Juan
Yes, "37" is about 38. 8 + 2 equals 10; therefore 38 + 42 = 80

Teacher
Juan, good work--"38 and 42" are compatible numbers. They are another way of estimating.

They gave the same estimate that rounding gave. But now you know another way to go at estimation.

Children have fun sharing views on how they see the math. Their creativity and love of math is ignited, because they become the architects of their own mathematical reasoning. Many number concepts can be integrated to develop compatible numbers. Number combinations such 5.25 and .50 are compatible pairs building on student's concepts of adding money. Compatible numbers for addition and subtraction are numbers that go together easily to make landmark (benchmark) numbers.

Students can practice estimation by placing sets of two-digit numbers on an addition board. Have students present their estimation strategy. Engage the class in a math talk with the class to discuss extending their estimation strategies to include compatible numbers. Gently nudge them in the right direction to refine their thinking.

Division and compatible numbers

For division, compatible numbers can provide an alternative to estimation using rounding. Have the students look at close approximation to the single-digit divisor. In the following example of 312 divided by 8, the student would reflect on the multiples of 8.

Teacher
Can you estimate the quotient of 312 ÷ 8?

Kelly
Well, 312 rounds to 300, and 8 rounds to 10, therefore 300 ÷ 10 ≈ 30.

Teacher
You did a nice job rounding Kelly, but I believe compatible numbers can get you a closer estimate. Think about your multiples of 8 and change your dividend based on a rounded multiple of 8.

Kelly
I know that 8 × 12 = 32, so I can change 312 to 320. Therefore 320 ÷ 8 ≈ 40.

Teacher
Kelly, which estimate is closer to the actual answer?

Kelly
The actual solution to the equation is 39. The compatible numbers worked better than rounding.

They produced a closer estimation of the answer.

Increasing flexibility and speed in estimation

Estimation should be done quickly and mentally to produce reasonable answers. Students need to gain confidence in their ability to estimate and become flexible in their estimation thinking. Therefore, it is important to engage them in discussions, and listen to how they think. The National Science Foundation suggested this to teachers over thirty years ago (Reyes R. B., 1984).

Teachers need to exercise precaution when assessing estimation. The purpose of estimation is to make mathematics more student-friendly. When assessing, provide open-ended opportunities rather than multiple-choice questions, which imply that there is only one right answer. Much of the time, assessment is done orally, so that students can explain their thinking. As stated by " Van De Walle, Karp, and Bay-Williams (2008)

"Remember your primary goal is to help students develop strategies for making computational estimates quickly. As students get comfortable with using compatible numbers, they will increase their speed in estimating."

Conclusion

After teaching a lesson on compatible numbers, I glanced again at the annoying cartoon of the toddler who solved the math problem but did not understand it. " Well," I thought, " now that I am teaching about compatible numbers, my students are coming a lot closer to understanding and reasoning mathematically." I recognize my students in class are using these methods while problem solving more and more everyday.

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Voices from the Classroom:

Dining In Versus Eating Out

The new math standards for kindergarten through seventh grade are on everyone's mind. For all grades, one of the biggest changes is the addition of the personal financial literacy standards. As an adult, I found myself wondering if I knew enough of the material to properly teach a student in the seventh grade. I wanted to make lessons that were engaging and creative while at the same time making sure that mastery was reached. I designed a lesson that integrated the process standards and 7.13A, "calculate the sales tax for a given purchase." Below are the lesson and student recording sheet.

Engage:

Divide the students into groups of 3 or 4. Present the following questions to each group: What is their favorite restaurant? What do they eat there? Do they think it is expensive to eat there? Would it be cheaper to eat the same meal at home? Justify why or why not.

Activity:

Using a tablet or a computer each student will research the cost of a meal at their favorite restaurant. Students will find a recipe(s) for the same meal and record the ingredients on the activity sheet. Based on the recipe(s), the students will determine the cost for each item. Students will calculate the total cost for dining in and for eating out. Remind the students to calculate the sales tax for eating out only (there is no sales tax on food from the grocery store). Remember that most recipes feed 4 people while each person has to order the meal at the restaurant.

Prior Knowledge:

Percent and adding, subtracting, and multiplying decimals

Vocabulary:

Sales tax

Assessment:

Did the students understand the financial impact of dining in versus eating out? Were the students able to calculate the correct bill for eating out?

Differentiation:

Have the students work with a partner; give the students a list of websites that you want them to use; have on hand a small collection of coupons from the grocery store and/or the restaurant.

Materials:

Worksheet, tablets or computers

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Dining In Versus Eating Out

Student Activity Sheet

You will be determining whether it is cheaper to dine in or eat out and justify your conclusion. You will design a meal for you and your family to cook at home. You should assume everyone in your family is eating the same meal.

You have to find the recipes that you are going to use and determine the total cost of the meal by ingredient. You will then go to a restaurant that would sell a similar meal and determine the cost for your family to eat that meal at the restaurant.

Recipe(s) for dining in: _____

Ingredient	Cost for the Ingredient

Total cost of dining in per serving:

How much was the restaurant bill, including tax (8.25%)?

What is the difference in cost between dining in and eating out?

Why do you think this activity was important?

Extension:

Research coupons and/or sales that would make either dining in or eating out cheaper. On the back write your sales and/or coupons amounts. Make sure you include your new price for dining in and/or eating out. Was the gratuity (tip) included in the calculation? Why or why not?

TCTM Leader Spotlight

Each year since 1995, TCTM has accepted nominations for two awards for leaders in our professional community. The TCTM Leadership Award is presented to a TCTM member who is nominated by a TCTM affiliate. The second award, the E. Glenadine Gibb Achievement Award, is presented to someone nominated by a TCTM member. The following individuals have been honored and we wish to acknowledge their former and ongoing contributions this year in the leader spotlight. **If you wish to nominate someone for 2015, please download the forms from our website. Please submit your nomination by Dec. 31, 2014.**

Our prior awardees are:

Year	Leadership(local/state)	Gibb (state/national)
1995	Mary Alice Hatchett	Iris Carl
1996	Betty Forte	Cathy Seeley
1997	Diane McGowan	Pam Chandler
1998	----	----
1999	Linda Shaub	Eva Gates
2000	Lloy Lizcano	Bill Hopkins
2001	Susan Hull	Pam Alexander
2002	Janie Schielack	Judy Kelley
2003	Bonnie McNemar	Dinah Chancellor
2004	Dixie Ross	Jacqueline Weilmuenster
2005	Barbara "Basia" Hall	Barrie Madison
2006	Nancy Trapp	Lois Gordon Moseley
2007	Kathy Hale	Cynthia L. Schneider
2008	Jim Wohlgeheagen	Juanita Copley
2009	Jane Silvey	Jo Ann Wheeler
2010	Elaine Young	Paula Steffen Moeller
2011	Beverly Burg Anderson	Jennie M. Bennett
2012	Paul Gray, Jr.	Linda Gann
2013	Vodene Schultz	Anne Papakonstantinou
2014	Caren Sorrells	Noemi Rodriguez-Lopez

Apply now for a MET Grant, Scholarship, or Award!

NCTM's Mathematics Education Trust (MET) channels the generosity of contributors through the creation and funding of grants, awards, honors, and other projects that support the improvement of mathematics teaching and learning.

MET provides funds to support classroom teachers in the areas of improving classroom practices and increasing mathematical knowledge. MET also sponsors activities for prospective teachers and NCTM Affiliates, as well as recognizing the lifetime achievement of leaders of mathematics education. Grant, scholarship, and award funding ranges from $1,200 to $24,000 and can be used for conferences, workshops, seminars; research and in-service training in mathematics coursework; or professional development activities. MET is currently accepting applications for its summer cycle of grants and scholarships for current and future math teachers. The deadline is November 7, 2014.

If you are a teacher, prospective teacher, or school administrator and would like more information about MET grants, scholarships, and awards, please visit their website,

<http://www.nctm.org/resources/content.aspx?id=198>

or e-mail them at *<exec@nctm.org>*.

Texas Mathematics Teacher's Writers Retreat

Our first Writers Retreat was January 18-20 in Austin. A total of 14 dedicated teachers came together to learn more about writing for the *Texas Mathematics Teacher* and to learn from each other. Over the three-day event we shared stories, spent time writing, talked about teaching and did some mathematics. The topics for our workshops included Copyright, Intellectual Property, Plagiarism, APA Style, Hot Topics, and the Role of the Reviewer. There was plenty of writing time allotted over the weekend and of course we harnessed the expertise of our participants to improve the *Texas Mathematics Teacher* by asking them lots of questions!

The facilitators were:

Cynthia L. Schneider, Ph.D., Independent Consultant

Paul Gray Ed.D., The University of Texas at Austin

Mary Alice Hatchett, Independent Consultant

Sandra Cooper, Ph.D., Baylor University

The 2014 participants were:

Ludy Silva,
Austin ISD

Anne Clark,
Irving ISD

Lauren Hilton,
Irving ISD

Ashley Brittain,
China Springs ISD

Kayla Brown,
Midway ISD

Ebony Cousins,
Midway ISD

Karen Mayton,
Midway ISD

Debbie Perry,
Midway ISD

Veronica Galvan,
Harlingen CISD

Valerie C. Blackburn,
Education Outreach, UTMB

If you would like to participate in the 2015 Writers Retreat, please complete the online application before October 1. The link may be found at *www.tctmonline.org* from the Texas Mathematics Teacher on the home page. All travel expenses are paid; all we need are your great ideas and time!

Cynthia L. Schneider, Ph.D.
• *Independent K-12 Mathematics and Research Consultant*
Austin, TX • *<cschneider@utexas.edu>*

About This Publication

Since 1971, the Texas Council of Teachers of Mathematics (TCTM) has produced the journal *Texas Mathematics Teacher* for our members. Our mission is to promote mathematics education in Texas. In the journal we accomplish this by publishing peer-reviewed articles by leading authors and local news from around the state. TCTM is committed to improving mathematics instruction at all levels. We place an emphasis on classroom activities that are aligned to the Texas Essential Knowledge and Skills and the NCTM *Principles and Standards for School Mathematics*.

The *Texas Mathematics Teacher* seeks articles on issues of interest to mathematics educators, especially K-12 classroom teachers in Texas. All readers are encouraged to contribute articles and opinions for any section of the journal. Teachers are encouraged to submit articles for Voices From the Classroom, including inspirational stories, exemplary lessons, or management tools. More specific guidelines for submissions may be found below.

Original artwork on the cover is another way teachers may contribute. We publish the journal twice each school year, in the fall and spring semesters. Our website archives the journals in PDF format. Please see

<*www.tctmonline.net*>

if you wish to view prior issues.

Our current Editorial Board consists of Cynthia Schneider, Mary Alice Hatchett, Geoffrey Potter, Larry Lesser, James Epperson and Katey Arrington. Larry, James and Katey serve as expert advisors; Cynthia is the editor. Mary Alice does many jobs, including requesting articles, serving as an elementary expert, and communicating with authors. Geoff is the layout and graphic designer; he manages to fit all the text into the limited number of pages we have to work with. The TCTM Board wishes to thank them for their leadership in producing the *Texas Mathematics Teacher*.

Advertising Guidelines for Texas Mathematics Teacher

All advertising is subject to the approval of the publisher. The journal staff shall be responsible for ascertaining the acceptability of advertisements. All advertisements should be sent "copy-ready" by the closing dates of September 1 for the fall issue and January 15 for the spring issue. Position preference, such as right-hand pages or first half of issue will be honored on a first-come basis. All advertisements must be pre-paid by the closing date with a check made payable to TCTM, and mailed to our current treasurer, Martha Godwin. Rates for *Texas Mathematics Teacher* per issue are: full page $500.00, half page $300.00, quarter page $200.00.

All advertisers must adhere to the guidelines posted on our website at <*www.tctmonline.org*>.

Editorial Board

Texas Mathematics Teacher (ISSN# 0277-030X), the official journal of the Texas Council of Teachers of Mathematics (TCTM), is published in the fall and spring. Editorial correspondence should be mailed or e-mailed to the editor.

This journal is funded by the Texas Council of Teachers of Mathematics and printed at The University of Texas at Austin, which does not imply endorsement by the University or by the Charles A. Dana Center.

Call For Articles

Texas Mathematics Teacher seeks articles on issues of interest to mathematics educators, especially K-12 classroom teachers in Texas. All readers are encouraged to contribute articles and opinions for any section of the journal.

Manuscripts, including tables and figures, should be typed in Microsoft Word and submitted electronically as an e-mail attachment to the editor with a copy to the director. No author identification should appear on or in the manuscript. A cover letter containing author's name, address, affiliations, phone, e-mail address, and the article's intended audience should be included. After refereeing, authors will be notified of a publication decision.

Teachers are encouraged to submit articles for ***Voices From the Classroom,*** including inspirational stories, exemplary lessons, or management tools. If submitting a lesson, it should include identification of the appropriate grade level and any prerequisites.

Items for ***Lone Star News*** include, but are not limited to, NCTM affiliated group announcements, advertisements of upcoming professional meetings, and member updates.

Businesses interested in placing an **advertisement** for mathematics materials should contact Mary Alice Hatchett. Advertisements do not imply endorsement by TCTM's board, editorial staff or members.

Deadline for submissions: Fall/Winter, July 1
Spring/Summer, January 1

TCTM 2014 Mission, Focus and Goal Statements

Mission of the Texas Council of Teachers of Mathematics:

To promote mathematics education in Texas

To support this mission, TCTM has five **focus areas:**

Recruit and Retain Mathematics Teachers	Curriculum and Instruction Support	Advocacy	Promote Communication among Teachers	Serve as Partner Affiliate for NCTM

TCTM activities will align to the five strategic goals. **Goals** of the organization include six strands:

Administration

- Streamline online membership registration through CAMT

Publications

- Survey membership to identify what they want in the *Texas Mathematics Teacher* (*TMT*)
- Review and refine the *TMT* journal and the TCTM website
- Improve the review protocol, establish criteria for reviewers
- Provide tips for new teachers in the *TMT* and on the website

Service

- Increase the donations toward Mathematics Specialist College Scholarships
- Staff CAMT with volunteers as necessary
- Advertise affiliated group conferences on the TCTM website, in the *TMT* and at CAMT

Communication

- Maintain an e-mail list of members for timely announcements
- Communicate with affiliated groups in a timely manner

Membership

- Encourage affiliated groups to include TCTM registration on their membership forms

Public Relations

- Sponsor and staff the TCTM booth at CAMT
- Follow NCTM Advocacy Toolkit (2004) for increased voice of TCTM membership on issues relevant to our mission

TCTM Past-Presidents

1970-1972	James E. Carson	1984-1986	Ralph Cain	1998-2000	Pam Alexander
1972-1974	Shirley Ray	1986-1988	Maggie Dement	2000-2002	Kathy Mittag
1974-1976	W. A. Ashworth, Jr.	1988-1990	Otto Bielss	2002-2006	Cynthia L. Schneider
1976-1978	Shirley Cousins	1990-1992	Karen Hall	2006-2008	Jo Ann Wheeler
1978-1980	Anita Priest	1992-1994	Susan Thomas	2008-2010	Paul Gray
1980-1982	Patsy Johnson	1994-1996	Diane McGowan	2010-2012	Nancy Trapp
1982-1984	Betty Travis	1996-1998	Basia Hall		

The Conference for the Advancement of Mathematics Teaching

2015 George R. Brown Convention Center Houston, Texas June 24-26

2016 Henry B. Gonzalez Convention Center San Antonio, Texas June 29-July 1

2017 Fort Worth Convention Center & Omni Hotel Fort Worth, Texas July 10-12

2018 George R. Brown Convention Center Houston, Texas July 16-18

For more details, visit the CAMT website at *<www.camtonline.org>.*

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Mark your calendar for these important dates!

Central Texas CTM	Baylor University Waco, TX	***October 2, 2014***
Austin Area CTM	Kealing Middle School Austin ISD	***October 25, 2014***
Rio Grande Valley CTM	University of Texas – Pan American Edinburg, TX	***November 15, 2014***
NCTM 2014 Regional Meeting and Exposition	Houston, TX	***November 19–21, 2014***
Central Texas CTM	University High School Waco, TX	***January 31, 2015***
NCTM Annual Meeting and Exposition	Boston, MA	***April 15-18, 2015***
CAMT 2015	George R. Brown Convention Center Houston, TX	***June 24-26, 2015***