

Texas Mathematics Teacher

Volume LX Issue 2

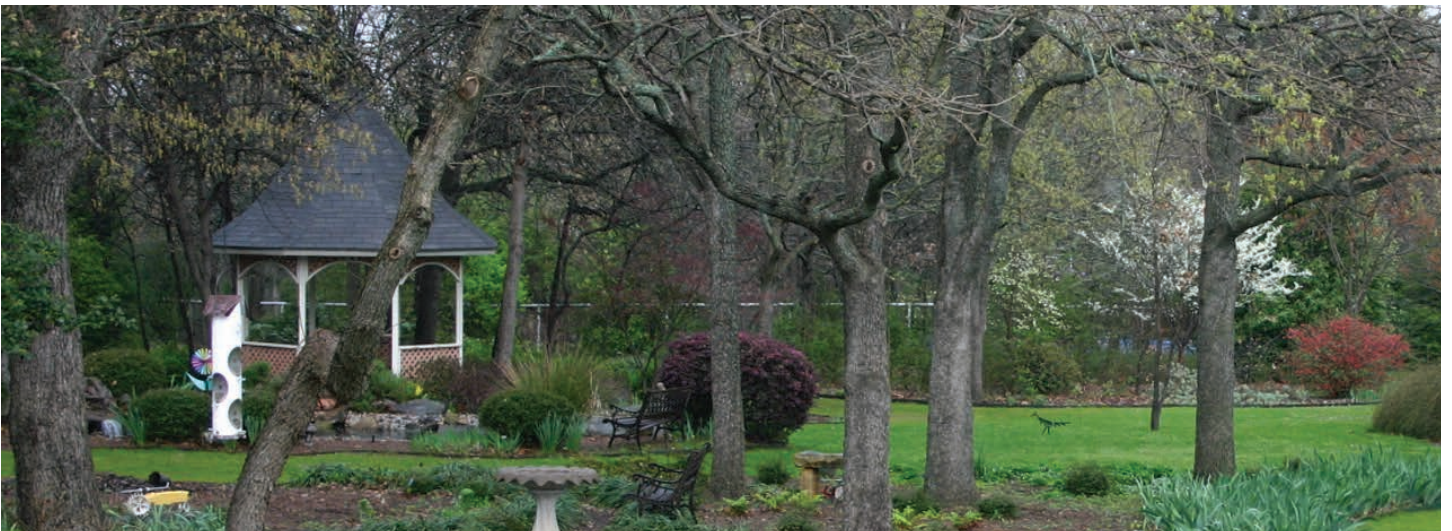
Fall/Winter 2013

Find the Mathematics...



... in the seasons!

see page 13



photos by Dinah Chancellor

Shape Shifter
A Student Activity
see page 17

Financial Literacy
Scavenger Hunt
see page 15

Puzzle Corner
and Quotes
see page 12

Texas Council of Teachers of Mathematics Executive Board 2014

President (2014)

Mary Alice Hatchett
20172 W. Lake Pkwy.
Georgetown, TX 78628-9512
mahat@earthlink.net

VP-Elementary (2015)

Amelia Hicks
15303 Kollmeyer Dr.
Austin, TX 78734
hicksa@ltsdschools.org

VP-Secondary (2014)

Pam Johnson
504 Caribbean Drive
Lockhart, TX 78644
pam.johnson@lockhart.txed.net

President-Elect (2014)

Martha Godwin
PO Box 82
Queen City, TX 75572
marthagodwin78@aol.com

Secretary (2014)

Faye Bruun
711 N. Carancahua
Corpus Christi, TX 78401
Faye.Bruun@tamucc.edu

Treasurer (2015)

Kathy Hale
2833 Broken Bough Trail
Abilene, TX 79606
khale@esc14.net

NW Regional Director (2014)

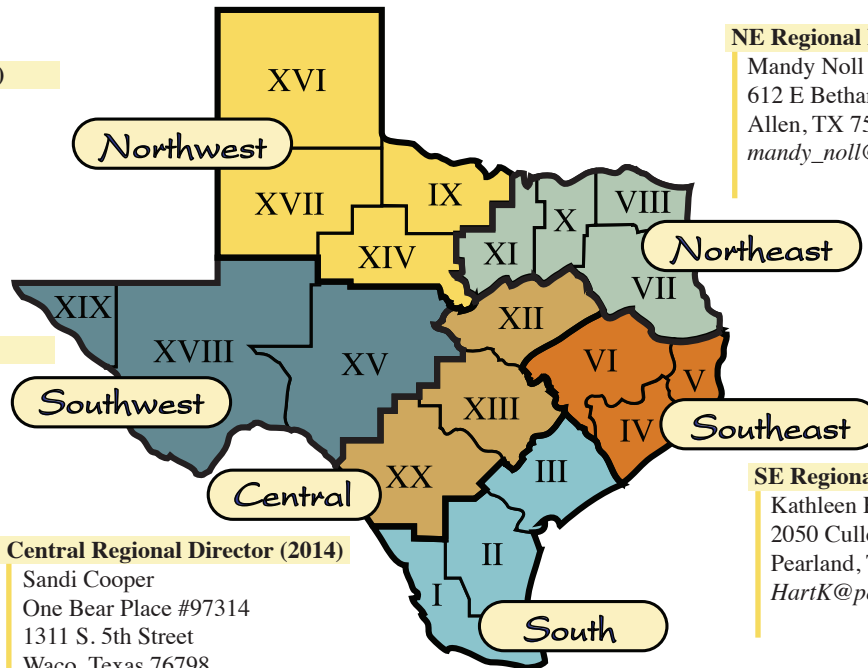
vacant

NE Regional Director (2014)

Mandy Noll
612 E Bethany Dr.
Allen, TX 75002
mandy_noll@allenisd.org

SW Regional Director (2015)

Christopher Hiatt
4901 E. University
Odessa, TX 79762
hiatt_c@utpb.edu



Central Regional Director (2014)

Sandi Cooper
One Bear Place #97314
1311 S. 5th Street
Waco, Texas 76798
Sandra_Cooper@baylor.edu

SE Regional Director (2015)

Kathleen Hart-Abel
2050 Cullen Blvd.
Pearland, TX 77581
HartK@pearlandisd.org

South Regional Director (2015)

Shere Salinas
801 Leopard Street
Corpus Christi, TX 78403
Shere.Salinas@ccisd.us

CAMT Board Rep [2016]

Cynthia L. Schneider
10015 Derecho Dr
Austin, TX 78737
cschneider@utexas.edu

CAMT Board Rep [2014]

Paul Gray
11902 Ashcroft Dr.
Houston, TX 77035
pgray73@sbcglobal.net

CAMT Board Rep [2015]

Nancy Trapp
15609 Brandt SR.
Raymondville, TX 78580
trapp@vtxb.com

NCTM Rep [2014]

Veronica Galvan
23377 E. Brown Tract Rd
San Benito, TX 78586
galvan_veronica@yahoo.com

Journal Editor [2014]

Cynthia L. Schneider
10015 Derecho Dr
Austin, TX 78737
cschneider@utexas.edu

Director of Publications [2014]

Mary Alice Hatchett
20172 W. Lake Pkwy.
Georgetown, TX 78628-9512
mahat@earthlink.net

Parliamentarian [2014]

Jerri LaMirand
601 Camp Craft Rd
Austin, TX 78746
jlamirand@eanesisd.net

Government Relations Rep [2014]

Cynthia L. Schneider
10015 Derecho Dr
Austin, TX 78737
cschneider@utexas.edu

Membership Chair [2014]

Cynthia L. Schneider
10015 Derecho Dr
Austin, TX 78737
cschneider@utexas.edu

CAMT Volunteer Chair [2014]

Kelly Meshell
201 Llama Loop
Kyle, TX 78640
KMshell@austinisd.org

NCTM ASC Representative for the Southern 2 Region (2015)

E. Jean Ware
2114 East Algonquin Trail
Shreveport, LA 71107-5404
ejeanware@aol.com

Elected Offices (Voting Members)

Appointed Offices

Liaisons



Texas Mathematics Teacher

A PUBLICATION OF THE TEXAS COUNCIL OF TEACHERS OF MATHEMATICS

Volume LX Issue 2

Fall/Winter 2013

cover photos by Dinah Chancellor

Articles

- 6 Using the Art of Paul Klee to Teach Fractions
- 22 Supporting Mathematically Talented High School Students

Features

- 11 Legislative Update and Advocacy
- 12 Puzzle Corner/Quotes for Thought
- 13 On the Cover: Find the Mathematics in the Seasons
- 13 Save The Date! TCTM Reception
- 14 CAMT 2014
- 14 Volunteer for CAMT 2014
- 15 Financial Literacy Scavenger Hunt
- 17 Shape Shifter: A Student Activity
- 18 Shape Shifter: Student Activity Answers
- 19 Photos from the 2013 Affiliate Leaders Conference
- 20 Voices from the Classroom: Building Bridges
- 21 On the Cover Answers
- 27 Factoids
- 28 Voices from the Classroom: Travels of Pythagorus
- 30 2013-14 TCTM Mathematics Scholarship Recipients
- 30 TCTM Leadership Spotlight
- 30 Apply for a MET Grant
- 31 NCTM 64th Delegate Assembly
- 31 PAEMST (Presidential Awards)
- 32 CAMT Board Update
- 33 Voices from the Classroom: What A Leader Should Know
- 33 Recommended Readings

Departments

- 2 TCTM Board / TCTM Map of Regions
- 4 Letter From the President
- 5 Lone Star News
- 15 TEA Talks
- 16 TCTM Communications
- 34 About This Publication /Advertising Guidelines
- 35 TCTM Mission Statement

TCTM Applications

- 4 TCTM Membership
- 16 2014-15 Mathematics Preservice Teacher Scholarship
- 16 2015 TCTM Grant Application
- 16 NCTM Membership

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



Letter from the President

Dear TCTM colleagues,

Once again, welcome to another edition of the Texas Mathematic Teacher. As mathematics educators at all levels consider effective implementation and instruction related to our revised TEKS, a

frequently asked question remains, "What does it mean to be fluent in mathematics?" The answer, more often than not, is, "fast and accurate." Building fluency should involve more than speed and accuracy. It must go beyond procedures and computation.

The NCTM *Principles and Standards for School Mathematics* (2000) states,

Computational fluency refers to having efficient and accurate methods for computing. Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently. The computational methods that a student uses should be based on mathematical ideas that the student understands well, including the structure of the base-ten number system, properties of multiplication and division, and number relationships.

Isn't that a great description of fluency! It reminds all of us that a student cannot be fluent without conceptual understanding and flexible thinking.

Memorizing facts and procedures does not ensure fluency. So, how might we help students move toward mathematical fluency? Actions we might consider:

- Give students the opportunity to think about what they know and understand and to use it in ways that make sense to them.
- Model questions that students should be asking themselves as they strive to reach fluency in mathematics.

It is interesting to note that fluency isn't mentioned as much in the high school TEKS as it is for grades K-8. The grade K-8 TEKS refer to fluency in relation to mastery of basic facts and computational skills. Are there other mathematical areas in which we want students' thinking to be flexible, efficient, and accurate beyond computation and procedures? Can a student reach fluency in areas of geometry, algebra, or statistics? What does fluency look like in these content areas? What are the characteristics of a student who is fluent in MATHEMATICS?

Our students enter school with the mistaken belief that the goal in math is to do it fast and get it right. Do we unknowingly encourage that thinking? Do we congratulate students who quickly give the right answer? Do we become annoyed with the 'dead' silence when students, who might need more 'think' time, take too long? As we make 2014 New Year's resolutions, let's remember that our planning, our instruction, and our assessments must build on and value 'mathematical fluency' in our students. Fluency entails so much more than being fast and accurate! As NCTM past president, Cathy Seeley, wrote, *Faster Isn't Smarter!*

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>

Facebook: *Texas Council of Teachers of Mathematics*

Twitter: <tctmonline >

TCTM Membership

Join TCTM or renew your membership!

Please join TCTM each year! Your membership includes this journal as well as updates on state and national opportunities such as grants, competitions, or professional development. You may join TCTM either by attending the CAMT conference as a paid participant, or by using our membership form found online at <www.tctmonline.org>. If you are a paid participant at CAMT your TCTM membership is automatic for the school year following CAMT. Remember to renew your membership if you do not attend CAMT or are not a paid participant. Our current

membership dues are only \$13.00 per year. If you are a new or returning member, please find our membership form online at <www.tctmonline.org>. Just fill out the form and mail your check to our current treasurer. Sorry, we are not able to process electronic payments, but you can join or renew for multiple years. You may also donate to our scholarship fund at any time.



Affiliate Groups

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.

NORTHWEST REGION *Service Centers 9, 14, 16, 17*

Texas South Plains CTM

Contact: Treasure Brasher, <brasher1@suddenlink.net>

SOUTHWEST REGION *Service Centers 15, 18, 19*
Christopher Hiatt, Regional Director

Greater El Paso CTM

Contact: GEPCTM President, Craig Rhoads, <crhoad@sisd.net>

SOUTH TEXAS REGION *Service Centers 1, 2, 3*
Shere Salinas, Regional Director

The South Texas Region is on Project Share! The group is "Texas Council of Teachers of Mathematics: South Region."

Coastal CTM

Contact: Faye Bruun, <faye.bruun@tamucc.edu>, or visit <cctm.tamucc.edu>.

CTM @ Texas A&M University at Corpus Christi (Student Affiliate)

Contact faculty advisor Faye Bruun, <faye.bruun@tamucc.edu>.

CTM @ Texas A&M University at Kingsville (Student Affiliate)

Contact NCTM Representative: Susan Sabrio

Rio Grande Valley CTM

Contact: Lucy Munoz at <hlucymh@aol.com>, or visit <www.rgvctm.org>.

STATEWIDE

Texas Association of Supervisors of Mathematics (TASM)

Contact: Cathy Banks <cbanks@twu.edu>, or visit <www.tasmonline.net>.

The Association of Mathematics Teacher Educators of Texas (AMTE-TX)

Contact Trena Wilkerson at <Trena_Wilkerson@baylor.edu>, or visit <www.amte-tx.org>.

NORTHEAST REGION *Service Centers 7, 8, 10, 11*
Mandy Noll, Regional Director

East Texas CTM

Contact: Martha Godwin, <mgodwin@qcisd.net>.

Greater Dallas CTM

Contact: Richard Newcomb, <RNewcomb@cistercian.org>.

SOUTHEAST REGION *Service Centers 4, 5, 6*
Kathleen Hart-Abel, Regional Director

Fort Bend CTM

Contact: Alena McClanahan, <alena.mcclanahan@fortbend.k12.tx.us>.

CENTRAL TEXAS REGION *Service Centers 12, 13, 20*
Sandi Cooper, Regional Director

Austin Area CTM

Contact: President Ludy Silva, <ludysilva2@gmail.com>, or visit <www.aactm.org>.

Alamo District CTM

Contact: ADCTM president Linda Gann, <linda.gann@boerne-isd.net>

Central Texas CTM

Contact: President of CTCTM Sandi Cooper, <sandra_cooper@baylor.edu>, or visit <www.ctctm.org>.

NATIONAL

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



Using the Art of Paul Klee to Teach Fractions

The visual arts, which include drawing, painting, and sculpture, present an ideal and unique forum through which children can express their ideas, thoughts, and emotions. Early educational researchers such as Dewey (1934) argue that thinking in art improves thinking in other disciplines and, decades later, research still indicates that what students learn in the arts may help them master other subjects, such as reading, mathematics, or social studies (Deasy, 2002). In fact, several independent studies have shown that increased years of enrollment in arts courses are positively correlated with higher SAT verbal and math scores (Ruppert, 2006). Additionally, participation in the visual arts lends itself to the development of critical thinking skills and abstract thought and, further, it nurtures a motivation to learn by emphasizing active engagement, disciplined and sustained attention, persistence, and risk taking, among other competencies (Ruppert, 2006).

When you consider some of the elements of art, namely, line, shape (2D), form, and space (3D), the connection between mathematics and the visual arts is hard to deny. By integrating the visual arts into the teaching of mathematics, a teacher can deepen students' understanding of a variety of mathematical concepts by making these concepts less abstract and, instead, more concrete, visual, and tangible (Ward & Troutman, 2012). Further, encouraging students to examine pieces of art provides them with opportunities to discriminate, analyze, reason, judge, communicate, and make connections (MENC, 1994). These are some of the same skills and activities that NCTM (1989, 1991, 2000) strongly advocates, as children engage in the learning of mathematics. Thus, it makes sound sense, mathematically speaking, to integrate the visual arts into the teaching of mathematics, especially with young children, as a means to ignite students' creativity, capture their imaginations, and showcase mathematics in engaging ways.

Put on your "math goggles"!

For the last decade, I have been using the visual arts as a tool for motivating the teaching and learning

of mathematics. Whether providing professional development opportunities for teachers or working with students in classrooms, I always encourage my audience to put on their "math goggles" (Ward, 2012, p. 9) as a way to find the existence, beauty, and applicability of mathematics not just in the arts, but also in their world. For example, with pre-K students, I use Vincent van Gogh's *Starry Night* as the focal point to a counting activity. After creating their own van Gogh-inspired masterpiece, with their math goggles in place, children estimate, count, and compare the number of foil star stickers adorning their night skies in their hand-colored artwork. Similarly, with fourth and fifth grade students, I use the larger-than-life flowers painted by Georgia O'Keeffe as a springboard to an exploration of scale, scale factor, and its impact on area and perimeter. Using the visual arts as a lens for learning mathematics and making this direct link between these two content areas allow students to experience mathematics as a meaningful endeavor that makes sense and which builds connections (NCTM, 2000).

In the activity described herein, second graders created their own artwork in the spirit of Paul Klee and then used their masterpieces as a lens for learning about fractions.

Paul Klee's *Farbtafel*

Paul Klee (1879 – 1940) was a twentieth century expressionist artist whose father was a German music teacher and whose mother a Swiss singer. Despite becoming an accomplished violinist, Klee abandoned music to pursue a deep interest in drawing. As Klee progressed in his artistic career, he became a master at manipulating color with great skill and passion. His works possess a whimsical, child-like quality and he often incorporated geometric forms as well as letters, numbers, animals, and musical notations into his masterpieces. Many of his works and their titles reflect his humor and mood, and frequently allude to poetry, dreams, and music.

A second grade teacher and I recently used Paul Klee's *Farbtafel* (1930), as the focal point of an exploratory activity in which second graders were

challenged to identify fraction names and to add fractions with like denominators, despite never having learned any formal algorithm for adding fractions in the classroom. Translated as “color table,” Klee’s *Farbtafel* might be described mathematically as a 5 X 7 array of a variety of multi-colored squares (see Figure 1). This work of art serves brilliantly as a medium for naming fractions, given its many colored, nearly equally-sized square regions. Additionally, this “really cool checkerboard,” as one student described it, might also work well as a springboard to an exploration of area and perimeter.

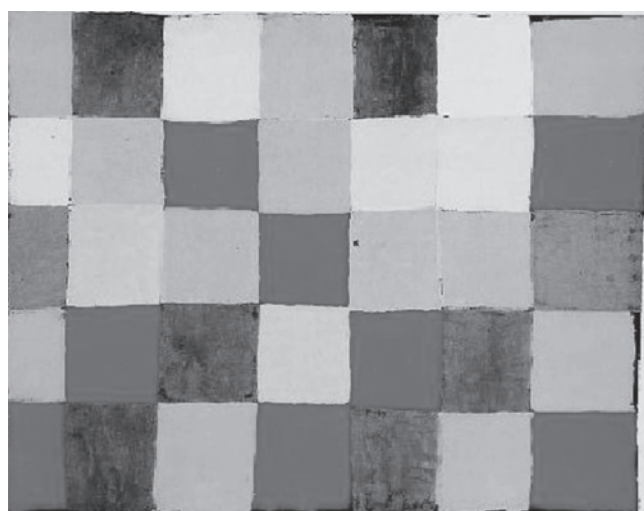


Figure 1. Paul Klee’s *Farbtafel* (1930)
(Image retrieved from <www.artinthepicture.com>)

Creating a mathematical masterpiece

After viewing various images of Klee’s artwork while learning biographical information about the artist, second graders gazed at *Farbtafel* and were first asked to estimate how many squares they thought might comprise his color table. Several children responded, articulating how they arrived at their estimation. Given that nearly all of the children had previously mastered the array model for multiplication, most students responded that 35 squares appeared in *Farbtafel*, observing that Klee’s artwork contained five rows and seven columns of colored squares. A few students stated that the masterpiece contained 40 squares, due to miscounting the number of columns, by thinking there were eight columns, as opposed to seven.

Next, the second grade teacher directed her students’ attention to a classroom table on which were arranged nine piles of two-inch squares of varying colors, cut from construction paper prior to class. Students were asked to select 15 squares of any color and then arrange and glue the colored squares onto a 3 X 5 grid printed on their worksheet (see Figure 2). As students counted and collected their colored squares, the teacher encouraged them to reflect on how Klee experimented with color-blending and to keep this in mind as they considered which colored squares to choose. She also encouraged them to choose a variety of colored squares, knowing this would enhance their learning experience when they were later challenged to name the individual colored fractional parts comprising their Klee-inspired masterpieces.

Name _____

Our own Paul Klee-inspired *Farbtafel* (1930)

Figure 2. Worksheet featuring the 3 X 5 grid onto which students arranged and then glued their fifteen colored squares.

After selecting their colored squares, students began creating their 3 X 5 color tables (see Figure 3). As students worked, the classroom teacher and I watched curiously, noticing how students moved the colored squares to-and-fro on their paper, seeming to mentally assess whether they liked the squares’ color combinations and placements. Some students returned squares back to their respective colored piles on the classroom table, selecting new ones of different color to replace them, all in search of the “right” artistic color combinations. Both the teacher and I believe that the decision-making process of selecting colored squares and determining where the colored squares should be positioned on the 3 X

5 grid presented an additional academic perk to the activity, as students were critically thinking about, comparing, and contrasting color arrangements. Some second graders even created patterns on their grids! Once the students completed their masterpieces, the teacher requested that the students select a creative title for their Klee-inspired artwork. We marveled at the creativity of their titles, ranging from *The Man*, a grid featuring what looks like a purple stick man in the center (see Figure 4), and *The Red Pyramid*, a grid featuring ascending and descending red squares (see Figure 5).

Figure 3. A second grader places and then glues her colored squares onto her 3 X 5 grid.

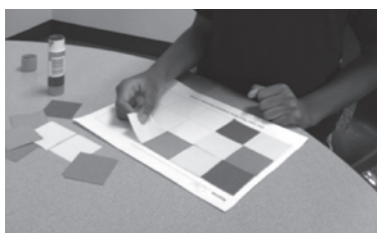


Figure 4. A second grader spies a purple stick man in the center of her masterpiece entitled, *The Man*.

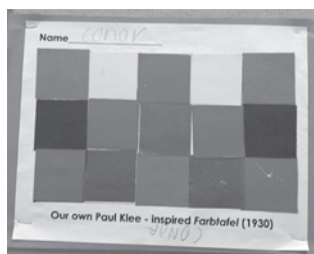


Figure 5. A second grader entitles his artwork, *The Red Pyramid*.

Exploring fractions using *Farbtafel*-inspired artwork

Once students finished creating their Klee-inspired masterpieces, they completed a worksheet in which they had to record the fractional amount of each colored square appearing in their 3 X 5 color table (see Figure 6). Students completed this portion of the worksheet with relative ease, as they had prior classroom experiences with naming fractions using visual models. However, given that her students had not yet learned how to add fractions with like denominators either conceptually or procedurally at this point in the year, the second grade teacher and

I were most interested in seeing how her students would respond to the challenge question appearing on the worksheet which asked, “Add together all of the above fractions. What is your total?” We were amazed that more than half (12 out of 19) of the students responded with the correct answer of 15/15 without any facilitation. However, what was more remarkable was how some of the students had arrived at their solution.

NAME: _____

Using your Paul Klee-inspired artwork, record the following:

Fraction of blue squares: _____

Fraction of red squares: _____

Fraction of orange squares: _____

Fraction of green squares: _____

Fraction of purple squares: _____

Fraction of pink squares: _____

Fraction of beige squares: _____

Fraction of yellow squares: _____

Fraction of brown squares: _____

Add together all of the above fractions. What is your total? _____

Explain your solution!

Figure 6. Worksheet on which students recorded the fractional amount of colored squares comprising their 3 X 5 grid.

For example, one student said, “Well I knew I had fifteen squares and that number goes on the bottom. That’s the number of all the parts.” He continued on, pointing to each of the squares saying, “And then I was just counting up all of the squares I have. I have four brown, four blue, four purple, and three green. That’s fifteen. So that number goes on the top. I’m adding all of the squares up.” What this child was articulating was that he knew he had a total of fifteen parts (i.e., squares), and so fifteen was the denominator of his fraction. Then, in order to determine the numerator, he knew he had to find the sum of all of the individual colored pieces, since that was the part being named. Thus, he correctly recorded the fraction, fifteen-fifteenths, on his worksheet.

Another student, after recording fifteen-fifteenths on his worksheet and noticing that the numerator and denominator were the same, announced, “Cool! This is weird. They both add up to fifteen.” The second grade teacher asked him why he thought his answer was “weird.” After several seconds of

wait time, he explained, “Well, you’re adding up all of the different squares to get the top number, but that’s the same number of squares on the bottom, the denominator.” I believe the second grader thought the fraction, fifteen-fifteenths, was “cool” because he had not seen a fraction in which the numerator and denominator were the same, as his classroom experiences were primarily limited to fractions less than one whole. Recognizing this, the second grade teacher and I capitalized on this teachable moment of making sense of examples of fractions where the numerators and denominators are the same, such as $2/2$, $3/3$, $4/4$, etc. For example, we described eating both of the two halves of pizza in a box, or hitting all three of the three baseballs pitched while at bat. What was most fascinating to the teacher and me was that none of the twelve students who recorded the correct answer of $15/15$ knew or relied on a formal procedural algorithm to find the sum of the individual fractions but, instead, contemplated the answer by conceptualizing what was being asked.

One other very teachable moment arose when a student’s hand shot up in the air because he obtained an answer of $14/15$ for the challenge question. I initially assumed that he added his colored squares incorrectly, obtaining a value of 14 in his numerator instead of 15. When the second grade teacher and I walked over to his desk to view his artwork and worksheet, we noticed that he had covered his grid with 14 colored squares, but left one square region on his worksheet blank; thus, it appeared as a white square. The student explained that he did not glue a colored square in this spot on the 3×5 array because he wanted his color table to *truly* resemble Klee’s *Farbtafel*, which contained only one white square. At this moment, the classroom teacher and I mutually realized that we did not include a line item on the worksheet where students could record “the fraction of white squares.” Thus, when this student summed all of the colored squares on his worksheet, he did indeed obtain a correct sum of 14 for the numerator, since the white square was not accounted for on the worksheet.

At the end of the activity, the second grade teacher adorned one of her classroom walls with all of the students’ artwork along side their calculations, showcasing to passersby the beauty and richness

of connecting mathematics to the visual arts (see Figure 7).

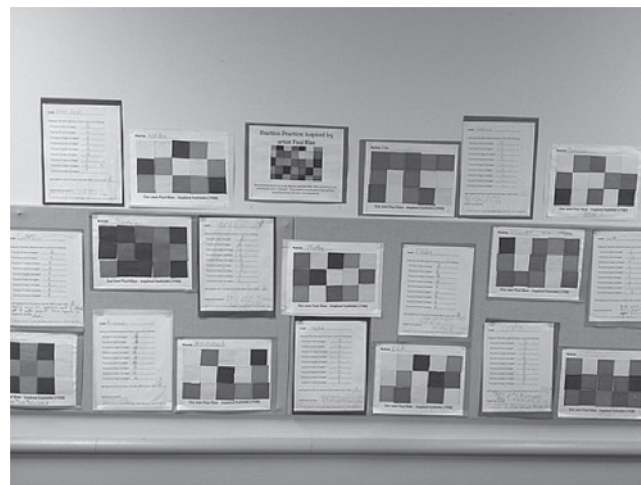


Figure 7. Students’ mathematical Klee-inspired artwork adorns the classroom wall.

Modifications

The Texas Essential Knowledge and Skills for Mathematics (TEKS, 2012) recommend that students in grades 2 and 3 partition objects into equal parts and name the parts using fraction names and symbols with denominators of 12 or less. This integrated math-art activity afforded the students the additional opportunity to work fractions as large as fifteenths, primarily because the classroom teacher wanted to challenge and extend the mathematical comfort zone of her students. To address the TEKS, a second or third grade teacher could easily adapt this activity by asking students to create a 3×4 grid of colored squares, and thus, students are working with twelfths.

Conclusions

NCTM (1989, 2000) advocates that school mathematics experiences at all levels include opportunities to learn about mathematics by working on problems that arise in contexts outside of mathematics. Similarly, “one of the most important goals” of the National Standards for Arts Education is to “help students make connections between concepts and across subjects” (MENC, 1994, p. 13). Using Paul Klee’s art provided these second graders with the opportunity to see a clever real-world connection between mathematics and the visual arts. In particular, students delighted in a colorfully

rich mathematical exploration of fractions, while simultaneously learning about an expressionist artist. Although much of this line of mathematical questioning could have been posed using a traditional worksheet featuring shaded fractional models, students would have been deprived of the creative connection to, and the hands-on experience in, the visual arts. Further, the level of excitement on the part of the children as they created their “color tables” was truly palpable and, students were elated to see their colorful artwork adorning the classroom wall the next morning.

Given the growing body of empirical and anecdotal evidence that documents the benefits of incorporating the visual arts into one’s teaching, I urge teachers to put on their “math goggles” and to use the visual arts as a lens for deepening students’ mathematical learning. Transform your mathematics classroom into an art gallery by getting your students to don both their artist and mathematical thinking caps and reap the benefits!

The author graciously thanks Jennifer Albritton, second grade teacher at All Saints’ Episcopal School in Fort Worth, TX, for allowing me the joyful opportunity to work with her and her students.

REFERENCES

- Deasy, R., ed. (2002). *Critical links: Learning in the arts and student academic and social development*. Washington, DC: Arts Education Partnership.
- Dewey, J. (1934). *Art as experience*. New York: Penguin.
- Music Educators National Conference (MENC). (1994). *National standards for arts education: What every young American should know and be able to do in the arts*. Reston, VA: MENC.
- National Council of Teachers of Mathematics (NCTM). (1989). *Curriculum and standards for school mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics (NCTM) (1991). *Professional standards for teaching mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics (NCTM). (2000). *Principles and standards for school mathematics*. Reston, VA: NCTM.
- Ruppert, S. (2006). *Critical evidence: How the arts benefit student achievement*. Washington, DC: National Assembly of State Arts Agencies (NASAA).
- Texas Essential Knowledge and Skills for Mathematics (2012, September 10) Retrieved October 26, 2013, from <http://ritter.tea.state.tx.us/rules/tac/chapter111/ch111a.html>
- Ward, R. (2012). *Math + art = fun: Activities for discovering mathematical magic in modern art*. Houston, TX: Bright Sky Press.
- Ward, R. & Troutman, S. (2012). If you want to motivate the learning of mathematics - Use the visual arts as a lens to learning. In D. Lapp & B. Moss (Eds.), *Exemplary instruction in the middle grades: Teaching that supports engagement and rigorous learning* (pp. 35-52). New York, NY: The Guilford Press.



Robin A. Ward, PhD • <raw1@rice.edu>
Assistant Professor of Mathematics • Rice University



Legislative Update and Advocacy

During the State Board of Education (SBOE) meeting of November 20-22, 2013, the Board worked on changes to the high school graduation plan that were called for by the legislature in House Bill 5. At this time, all students entering grade 9 in 2014-15 must select a high school endorsement (STEM, Business and Industry, Public Services, Arts and Humanities, and Multidisciplinary Studies). After the sophomore year, a student and their parent may file a form to graduate under just the Foundation High School Program. For just the Foundation, a student will need to take Algebra I, Geometry and one additional mathematics course. The list of courses that a student may pick from for this additional credit was split into those that must be taken before a fourth math credit (such as Math Models) and those that do not (such as Algebra II or Precalculus). A student graduating with an endorsement will need to have four math credits, again with the restriction that some of the credits (such as Math Models) may not be taken after others (such as Algebra II). Currently, only the STEM endorsement and the distinguished level of achievement require Algebra II. The Board has called for the development of an Applied Algebra II course and a non-AP Statistics course. The November meeting was the first reading of these proposed rules to TAC 74.11. The second and final reading will occur during the January Board meeting. If you have an opinion or insights to share with your SBOE member, please contact them. They are eager to hear from classroom teachers.

In addition, the board approved K-8 mathematics instructional materials under Proclamation 2014. Educator committee reviews occurred during summer 2013. The goal is to have classroom implementation of these materials in August 2014, as the legislature allocated funding for these materials as called for in the TEKS adoption.

The Board considered changes to the appointment of reviewers of instructional materials, but these changes will not be finalized until the SBOE meeting in January. The Texas Education Agency is now accepting nominations to the state review panels that will evaluate instructional materials submitted for adoption under Proclamation 2015 (which includes Mathematics, grades 9-12). To nominate yourself or someone else to serve on a state review panel,

please complete the form posted at <www.tea.state.tx.us/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=25769808256&libID=25769808258>, and submit it to the TEA on or before Friday, January 24, 2014.

You may contact any of these members of the SBOE with this email <sboesupport@tea.state.tx.us>. Be sure to identify your SBOE member in the message. The map of the SBOE districts may be found at <<http://www.tea.state.tx.us/index3.aspx?id=1156>>.

District Number	SBOE Member
1	Dr. Dominguez
2	Mr. Cortez, Jr.
3	Ms. Perez
4	Mr. Allen, Jr.
5	Mr. Mercer
6	Ms. Bahorich
7	Mr. Bradley
8	Ms. Cargill
9	Mr. Ratliff
10	Mr. Maynard
11	Ms. Hardy
12	Ms. Miller
13	Ms. Knight
14	Ms. Melton
15	Mr. Rowley



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



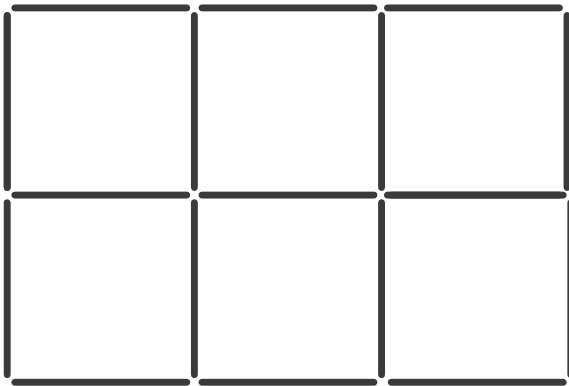
Puzzle Corner

Sticks #21 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.



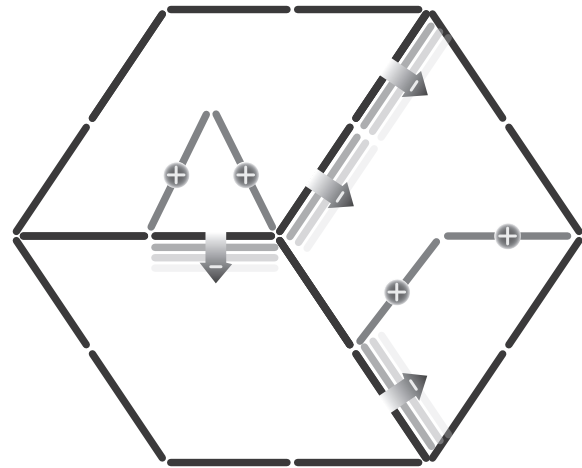
Puzzle:

Now remove five sticks, leaving three squares.

Sticks #20 Answer

Arrange 18 craft sticks to form a regular hexagon divided into three congruent regions. Now move four sticks to divide it into only two congruent regions.

Shown is a diagram of a solution.



Arrows indicate a moved or removed stick; plus-sign on a stick indicates new position.

12 coins in quarters and nickels worth \$2.00

Quotes for Thought

“If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is.”

John von
Newmann
pure and applied
mathematician and
polymath
(1903 - 1957)



“The vast majority of us imagine ourselves as like literature people or math people. But the truth is that the massive processor known as the human brain is neither a literature organ or a math organ. It is both and more.”

John Green
American writer of
young adult fiction and
a YouTube vlogger and
educator
(1977 - present)



“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

Alvin Toffler
American writer and
futurist
(1928 - present)



On The Cover

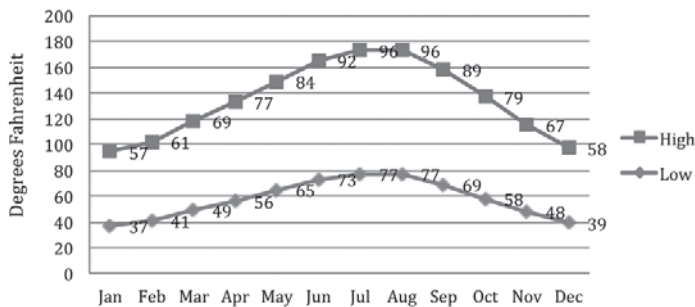
Find the Mathematics... in the seasons

When I look at these beautiful pictures, taken in northwest Texas, the first mathematical ideas that pop into my head are about temperature! Meteorologists use a scale known as Fahrenheit (F) to measure surface temperature. It was developed in the 1700s by G. Daniel Fahrenheit. Also in the 1700s, a second scale was developed by and named for the Swedish astronomer Andrew Celsius. For a long time this scale was called 'centigrade,' however since the word 'centigrade' in the Spanish and French language was a term used for angle measurement the term 'Celsius' (C) was formally adopted in 1948. A third scale known as the kelvin scale (K) was developed by and named after the Belfast-born engineer and physicist Lord Kelvin (William Thomson) in the mid 1800s. The kelvin scale is widely used by scientists, while the Celsius or Fahrenheit scales are more commonly used in daily life.

Since three different scales can be used to measure temperature, it seems reasonable to have formulas for changing or converting between scales. Here are some useful conversion formulas.

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \div 1.8 \quad ^{\circ}\text{F} = 1.8 \times ^{\circ}\text{C} + 32 \quad \text{K} = ^{\circ}\text{C} + 273$$

High/Low temperatures for 2012



This is a graph of the high and low temperatures recorded in the area for our cover picture during 2012.

Classroom questions for consideration:

1. If the temperature is 77°F, what would be the equivalent readings on the Celsius and kelvin scales?
2. If the temperature is 29°C, what would be the equivalent readings on the Fahrenheit and kelvin scales (to the nearest whole number)?
3. If the temperature is 260 K, what would be the equivalent readings on the Celsius and Fahrenheit scales (to the nearest whole number)?
4. Create a formula to determine the kelvin temperature given the degrees Fahrenheit.
5. Use the information in the graph to predict which month each of the cover photos was taken. Justify your prediction.
6. What symmetry and angle patterns are found in snowflakes?
7. What symmetry and angle patterns are found in ice crystals?
8. Pick a tree in Texas and describe the symmetry in the leaves.
9. What geometric figure can be found in a tree ring?
10. The liquid equivalent of the snow is 10 inches of snow = 1 inch of rain. How does the snowmelt contribute to the groundwater in your area?
11. Describe the differences between the summer and winter pictures. For example, are the pictures both from the same angle and magnification?



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

Save the Date!

TCTM Reception and Business Meeting at CAMT 2014
July 22, 2014
4:00-7:00 p.m.

If you are coming to CAMT in Fort Worth next summer (2014), join us at our annual reception!

You will find food, games, information, and door prizes.



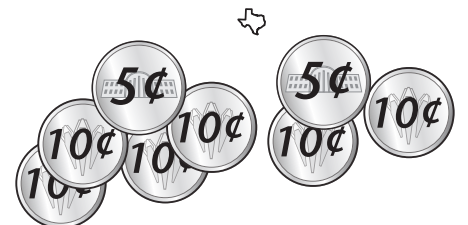
Ann Roman and Kathi Cook



Jerri LaMirand and Paul Gray

2013 TCTM Reception String Activity

<http://www.tctmonline.org>



CAMT 2014

CAMT 2014: Rebranding Math
Fort Worth Convention Center and the Omni Hotel

July 21 – 23, 2014
Fort Worth, TX

The Conference for the Advancement of Mathematics Teaching (CAMT) 2014 will be held July 21-23, 2014, at the Fort Worth Convention Center in Fort Worth, Texas. Take advantage of early-bird registration discounts before May 1.

The Elementary Administrators' Conference will be Monday, July 21 and the Secondary Administrators' Conference will be Tuesday, July 22. Both will be held at the Fort Worth Convention Center Arena. Registration to CAMT is complimentary to participants attending either of the Administrators' Conferences.

This year's featured speakers include Diane Briars, Ed Burger, John Carter, Marcy Cook, Pam Harris, Bob Horton, Jon Kitna, Matt Larson, Angela Maiers, David Molina, Christine Moynahan, Stuart Murphy, Todd Nesloney, Cindy Neuschwander, Tom Reardon, Eleanor Rodriguez, Cathy Seeley, Lee Stiff, Kim Sutton, Glenna Tabor, Uri Treisman, Judy Willis and Dinah Zike.



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

CAMT 2014 Volunteers

Dear Members of TCTM,
It's time to VOLUNTEER!

We believe that there is an opportunity for everyone to find their niche in helping CAMT to be a success for everyone involved – here's how you can join in on the efforts (we would love to have over 250 volunteers ready to go!). We are looking for fellow mathematics educators to assist us with supporting participants in areas such as the following: Registration, Exhibits, or Speaker Check-In. Come work "behind the scenes." We need you! Please e-mail, telephone or fax your name and contact information (be sure to include contact information for the summer) to Kelly Meshell, along with which of the following dates you are available to volunteer. Kelly will respond via e-mail or home phone with a specific scheduled time and location.

Thank you for making every CAMT a wonderful experience!

Volunteer Information

		I am willing to volunteer on July		20 th PM	21 th AM	21 th PM	22 th AM	22 th PM	23 th AM	23 th PM
Name:	Last		First		Middle					
Address:	Number and street								Apt. number	
	City				State		Zip Code			
	Contact: ()		()		Email Address					
Home Phone		Cell Phone								
Affiliation:	District or Professional Affiliation								ESC	

Please submit your form to Kelly Meshell,
 by mail: **Kelly Meshell**
201 Llama Loop
Kyle, TX 78640

or by email:
 < KMeshell@austinisd.org >

Financial Literacy Scavenger Hunt



Spring 2013 Winner
William (Bill) Luke

Last Issue's Winner

Congratulations to **William (Bill) Luke** from Copperas Cove, TX. Bill won a \$100 NCTM gift certificate. His name was drawn from the correct submissions to the Solve the Equation Scavenger Hunt in the Spring/Summer 2013 *Texas Mathematics Teacher*.

Financial Literacy Scavenger Hunt

In this issue you need to find the matching problem and solution for the Financial Literacy Scavenger Hunt. These problems and solutions may be found throughout this issue. Submit the page numbers of the missing problem or solution via email to Mary Alice Hatchett by February 1, 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 February 15, 2014.



	Problem (clue)	solution	page
1		2 dimes & 6 pennies	
2	7 coins worth 45¢ using only dimes and nickels		
3	70¢ in dimes and nickels using 8 coins		
4		7 quarters & 1 nickel	
5	5 coins in quarters and dimes worth \$1.10		
6	\$0.75 in dimes and nickels using 8 coins		
7	8 coins in quarters and nickels worth \$1.20		
8	15 coins in quarters and dimes worth \$3.45		
9	13 coins in quarters and dimes worth \$3.10		
10	12 coins in quarters and nickels worth \$2.00		
11	20 coins in dimes and nickels worth \$1.45		
12		5 quarters & 12 dimes	

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: Jo Ann Bilderback, Math/Science Content Specialist at (512) 463-9581 or <joann.bilderback@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>.



Application Information

2014-15 Mathematics Preservice Teacher Scholarship

There are ten \$2000 scholarships available for 2014-15. Any student attending a Texas college or university - public or private - and who plans on student teaching during the 2014-15 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, 2014. Winners will be announced in July 2014.



\$0.26 in dimes and pennies using 8 coins

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.



NCTM Membership

What's an easy way to support TCTM?

Join NCTM or renew your NCTM membership!

Sign up for your NCTM membership and use the link on the web form to indicate TCTM as the affiliate you wish to receive a rebate! Go to www.nctm.org.

TCTM will receive \$5.00 if you are joining NCTM as a new member, and \$3.00 if you are renewing. Now you can sign up directly with NCTM and give back to your state affiliate. However, you may only choose one state affiliate for the rebate (it will not be split).

Please remember, you cannot join your local affiliates from the NCTM website. You must join the local affiliates directly by the process they have established. You may join TCTM by either attending the CAMT conference as a paid participant, or by using our membership form found online at www.tctmonline.org.



TCTM Communications

Follow TCTM on Twitter!

Did you know that we now have an official Twitter account? Find out the latest about TCTM and other information just for Texas mathematics teachers!

twitter.com/tctmonline

Follow TCTM on Facebook!

Like the Texas Council of Teachers of Mathematics page on Facebook.

Snail Mail!

The journal is sent to the address you indicated on your membership form or the address that was used when you registered for CAMT. Please update your mailing address if it is not correct. If you have an e-mail address, please be sure it is on file and up-to-date with TCTM. If you do not have an e-mail address, please let us know. You may update your information online at www.tctmonline.org.



Shape Shifter: A Student Activity

The purpose of this activity is for students to gain experience in the properties of orientation and congruence of rotations, reflections, and translations of two-dimensional shapes on a coordinate plane.

- Use the graph paper vertically. Place the origin in the center.
- Locate and label points A-D:

- Connect points ABCDA. What is the name of this shape?

- Add 10 to each first coordinate and 5 to each second coordinate to get A₁ - D₁. Locate and connect these new points to make a congruent shape to ABCD.

- Draw a straight arrow from A to A₁. What is the horizontal and vertical distance from A to A₁?

- From A - D, add 10 to each first coordinate and subtract 5 to each second coordinate to get A₂ - D₂. Locate and connect these new points to make a new shape.

- Draw a straight arrow from A to A₂. What is the horizontal and vertical distance from A to A₂?

- What type of motion will move shape ABCD onto A₂B₂C₂D₂?

- What would you do to the coordinates of A, B, C, and D to translate shape ABCD 10 units to the left and 5 up? Locate and connect these new coordinates A₃ - D₃.

- What would you do to the coordinates of A, B, C, and D to translate shape ABCD 10 units to the left and 5 down? Locate and connect these new coordinates A₄ - D₄.

- Without drawing it - what would be the new coordinates of the vertices, if shape ABCD was moved 8 units to the right and 12 up. Fill in table A₅ - D₅ with your answer.
- Without drawing it - what would be the new coordinates of the vertices, if shape ABCD was moved 7 units to the left and 9 down. Fill in table A₆ - D₆ with your answer.

POINT	ORDERED PAIR
A	(-4, -2)
B	(-2, 2)
C	(1, 2)
D	(5, -2)

POINT	ORDERED PAIR
A ₁	(6, 3)
B ₁	(,)
C ₁	(,)
D ₁	(,)

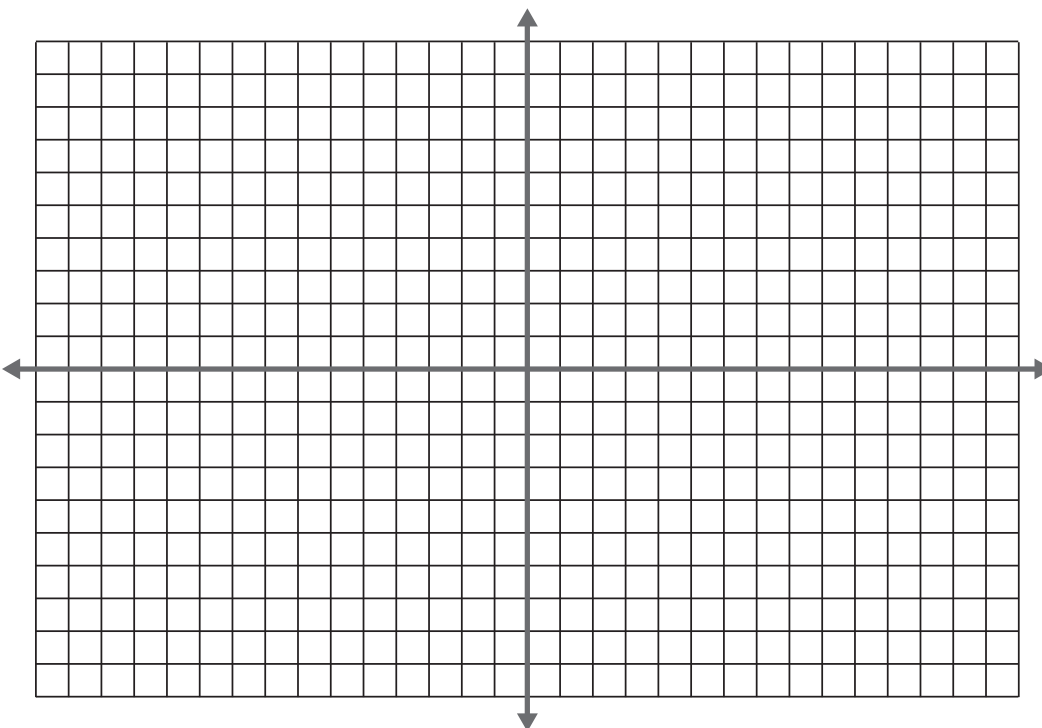
POINT	ORDERED PAIR
A ₂	(6, -7)
B ₂	(,)
C ₂	(,)
D ₂	(,)

POINT	ORDERED PAIR
A ₃	(,)
B ₃	(,)
C ₃	(,)
D ₃	(,)

POINT	ORDERED PAIR
A ₄	(,)
B ₄	(,)
C ₄	(,)
D ₄	(,)

POINT	ORDERED PAIR
A ₅	(,)
B ₅	(,)
C ₅	(,)
D ₅	(,)

POINT	ORDERED PAIR
A ₆	(,)
B ₆	(,)
C ₆	(,)
D ₆	(,)



Shape Shifter: Student Activity Answers

The purpose of this activity is for students to gain experience in the properties of orientation and congruence of rotations, reflections, and translations of two-dimensional shapes on a coordinate plane.

- Use the graph paper vertically. Place the origin in the center.
- Locate and label points A-D:
- Connect points ABCDA. What is the name of this shape?
trapezoid
- Add 10 to each first coordinate and 5 to each second coordinate to get A₁ - D₁. Locate and connect these new points to make a congruent shape to ABCDA.
- Draw a straight arrow from A to A₁. What is the horizontal and vertical distance from A to A₁?
horizontal=10; vertical=5
- From A - D, add 10 to each first coordinate and subtract 5 to each second coordinate to get A₂ - D₂. Locate and connect these new points to make a new shape.
- Draw a straight arrow from A to A₂. What is the horizontal and vertical distance from A to A₂?
horizontal=10; vertical=5
- What type of motion will move shape ABCD onto A₂B₂C₂D₂?
translation
- What would you do to the coordinates of A, B, C, and D to translate shape ABCD 10 units to the left and 5 up? Locate and connect these new coordinates A₃ - D₃.
add -10 to 1st coordinate and 5 to the 2nd coordinate
- What would you do to the coordinates of A, B, C, and D to translate shape ABCD 10 units to the left and 5 down? Locate and connect these new coordinates A₄ - D₄.
add -10 to 1st coordinate & subtract 5 from the 2nd coordinate
- Without drawing it - what would be the new coordinates of the vertices, if shape ABCD was moved 8 units to the right and 12 up. Fill in table A₅ - D₅ with your answer.
- Without drawing it - what would be the new coordinates of the vertices, if shape ABCD was moved 7 units to the left and 9 down. Fill in table A₆ - D₆ with your answer.

POINT	ORDERED PAIR
A	(-4 , -2)
B	(-2 , 2)
C	(1 , 2)
D	(5 , -2)

POINT	ORDERED PAIR
A ₁	(6 , 3)
B ₁	(8 , 7)
C ₁	(11 , 7)
D ₁	(15 , 3)

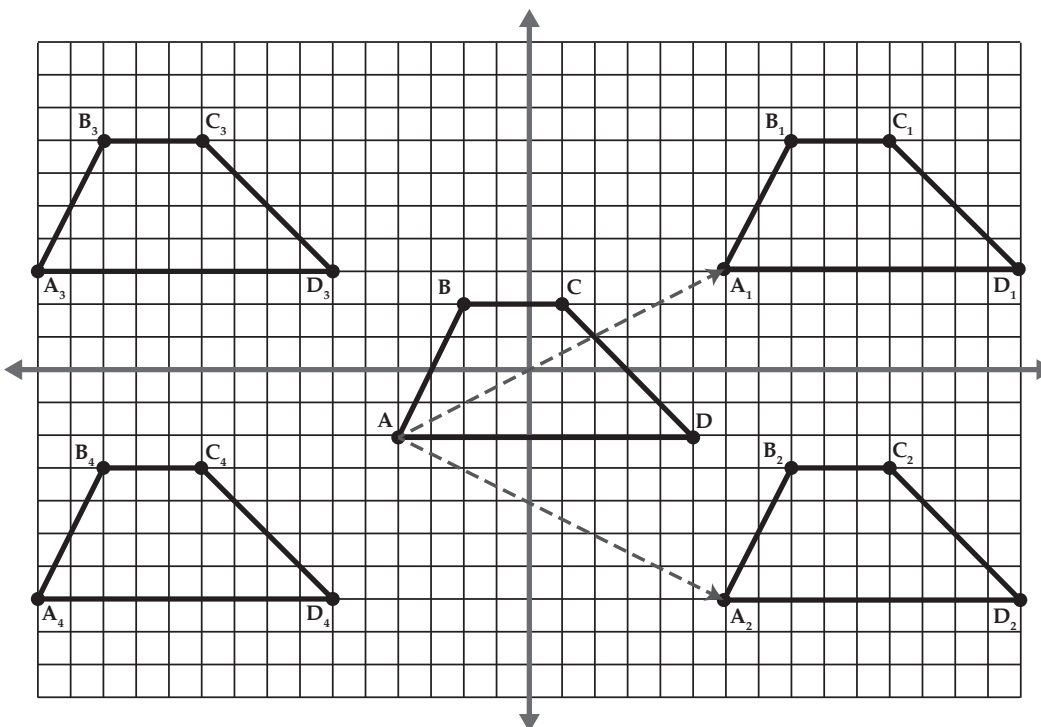
POINT	ORDERED PAIR
A ₂	(6 , -7)
B ₂	(8 , -3)
C ₂	(11 , -3)
D ₂	(15 , -7)

POINT	ORDERED PAIR
A ₃	(-14 , 3)
B ₃	(-12 , 7)
C ₃	(-9 , 7)
D ₃	(-5 , 3)

POINT	ORDERED PAIR
A ₄	(-14 , -7)
B ₄	(-12 , -3)
C ₄	(-9 , -3)
D ₄	(-5 , -7)

POINT	ORDERED PAIR
A ₅	(4 , 10)
B ₅	(6 , 14)
C ₅	(9 , 14)
D ₅	(13 , 10)

POINT	ORDERED PAIR
A ₆	(-11 , -11)
B ₆	(-9 , -7)
C ₆	(-6 , -7)
D ₆	(-2 , -11)



Photos From the 2013 Affiliate Leaders Conference hosted by the National Council of Teachers of Mathematics (NCTM)



Austin Area Council of Teachers of Mathematics (AACTM) Board Members:
(L-R) Amelia Hicks, Cynthia Schneider, Linda Gojak (NCTM President), Sandi Cooper, Mary Alice Hatchett, and Ludy Silva



Central Texas Council of Teachers of Mathematics (CTCTM) Board Members:
(L-R) Sandi Cooper, Linda Gojak (NCTM President) and Trena Wilkerson



Coastal Council of Teachers of Mathematics (CCTM) Board Member:
(L-R) Shere Salinas and Linda Gojak (NCTM President)



Texas Council of Teachers of Mathematics (TCTM) Board Members:
(L-R) Amelia Hicks, Cynthia Schneider, Linda Gojak (NCTM President), Shere Salinas, Mary Alice Hatchett, and Sandi Cooper.

Voices from the Classroom

Building Bridges in a Mathematics Classroom

As a first year teacher, you are constantly thinking of ways to improve, how to be more creative, and how to keep students engaged. With more significance, as a mathematics teacher you ponder on ways to build confident students who are excited about math. Teaching in a high-poverty school you come across many students with low math scores and mathematic ability. According to Heiman (2010), students in the nation's high-poverty schools are failing. So how do you build students' confidence levels? How do you bridge the achievement gap? Integrating subjects in the classroom allows for cross-curricular connections and retention among many students. All students enjoy making connections, they are more successful when they link learning with pleasure, an "inoculation against boredom and low effort" (Willis, 2012). In this article we discuss how a first-year teacher has students engage in a hands-on, cross-curricular activity.

What does this look like in the classroom?

In an afternoon school program at a high-poverty middle school, sixth-grade math students were gathered to engage in a hands-on lesson about bridges and shapes. The overall goal was for the students to build bridges using different shapes they had been introduced to during their geometry unit. Based on the shapes they used, students had to determine if their bridge was sturdier than another student's bridge. They had to determine if it was easier and sturdier when building a bridge using several shapes or using one shape such as a triangular structure.

Language Arts Connection

The activity began with the teacher having students participate in a read aloud with the book *Twenty-One Elephants Still Standing* by April Jones Prince. Before the read aloud began, students made predictions about what they believed would occur at the conclusion of the book based on the illustrations and title. Students came up with several ideas such as, "the elephants will cross a bridge and break it," or "the elephants will be test dummies to see if the bridge is strong enough." As the book was read, the teacher and students would stop occasionally and test their predictions against what was actually occurring in the book. Along with that, they would point out specific literary elements and discuss their effects on the progression of the story.

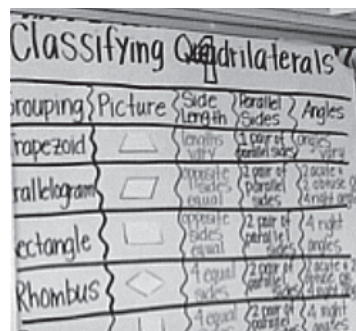
Social Studies and Science Connection

Once the reading was completed the teacher had students visit the website <http://www.neatorama.com/2008/03/07/10-most-beautiful-bridges-in-the-world/>. On this website students viewed the ten most beautiful bridges in the world. Students were given the opportunity to read about the history of the bridges; and compare and contrast their structures, location, and significance with the others. They also mentioned the material used to build the bridges, such as iron or stone, which tied in the science curriculum. Students were very fascinated with their findings and began

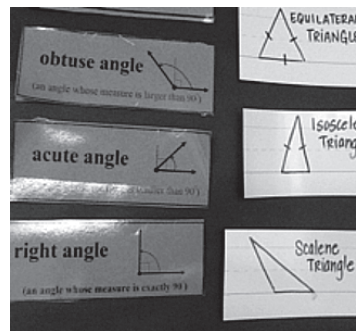
to point out some of the significant characteristics of the bridges which led to the mathematics.

Mathematics Connection

Students noticed many characteristics such as the shapes, lengths, and heights of the bridges they viewed. The teacher had them use pattern blocks to discuss some of the shapes' attributes and how they could be used to build bridges. Many of the conversations included angles, sides, and lengths as students referred back to charts and the word wall they used throughout the year. Students were allowed to build different bridges using triangular structures only, rectangular structures only, or a combination of the shapes. Students engaged in the activity and built very unique and different bridges with different characteristics, such as pyramids and prisms. The most rewarding part of the activity was watching the students struggle and arrange the shapes in various ways. There were many attempts, failures, and successes as they endeavored to build the bridge they desired.



Once the students completed their bridges they were given the opportunity to summarize their findings. For example, students were asked, "Was your bridge sturdier than a bridge using only triangular structures?" Students discussed how their base was stronger than one built with only triangular structures because they had four or more sides to work with and it was easier to arrange the shapes. The student using the triangular structures only expressed how her bridge was very difficult to make because she could not find a perfect way to arrange her triangular structures into a base. The sixth-grade students mentioned the struggles they noticed among one another.



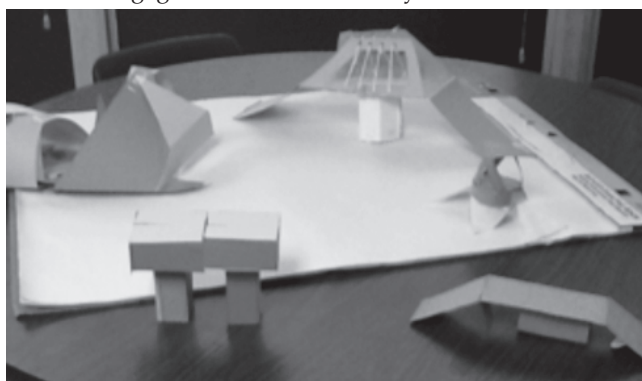
Art and Engineering

Due to the uniqueness of each student we were able to discuss how art was used as they built their bridges. One student mentioned how he was going to build his bridge using various sizes of triangular structures, with various colors, and no uniformity. One student used string, and others brought in many aspects of color. Finally, there was a discussion about people who build things such as bridges and buildings which brought in the engineering aspect. The

sixth-grade students were amazed at all the connections they made from one activity.

Conclusion

This activity definitely kept students engaged and thinking across the curriculum. As a first year teacher and even as a veteran teacher, it is very important to think of creative ways to teach students. Building cross-curricular activities are a great way to do so, and you would be amazed at how much the students know already. For my students, this was a precious moment for them to see things they had never seen and engage in math in a new way.



REFERENCES

- Heiman, M. (2010). Bridging the Mathematics Achievement Gap in Struggling Urban Schools. *Academic Leadership*, 8(2), 1-9.
- Willis, J. (2012). Executive Function, Arts Integration and Joyful Learning (Part 6 of 7). [Web log post]. Retrieved November 21, 2013, from <http://www.edutopia.org/blog/arts-integration-joyful-learning-judy-willis-md>



Kendra Bircher • Teacher
Boulter Middle School • <Kendra.bircher@tylerisd.org>



On the Cover: Classroom Question Answers

1. If the temperature is 77°F, what would be the equivalent readings on the Celsius and Kelvin scales?
25°C 298 K
2. If the temperature is 29°C, what would be the equivalent readings on the Fahrenheit and kelvin scales (to the nearest whole number)?
84°F 302 K
3. If the temperature is 260 K, what would be the equivalent readings on the Celsius and Fahrenheit scales (to the nearest whole number)?
21°F -13°C
4. Create a formula to determine the kelvin temperature given the degrees Fahrenheit.
 $K = ((^{\circ}F - 32) \div -1.8) + 273$
5. Use the information in the graph to predict which month each of the cover photos was taken. Justify your prediction.
various
6. What symmetry and angle patterns are found in snowflakes?
various
7. What symmetry and angle patterns are found in ice crystals?
various
8. Pick a tree in Texas and describe the symmetry in the leaves.
various
9. What geometric figure can be found in a tree ring?
concentric circles
10. The liquid equivalent of the snow is 10 inches of snow = 1 inch of rain. How does the snowmelt contribute to the groundwater in your area?
some in parts of Texas, less or none other parts
11. Describe the differences between the summer and winter pictures. For example, are the pictures both from the same angle and magnification?
not same angle, not same magnification

Supporting Mathematically Talented High School Students

In 2009, the National Council of Teachers of Mathematics published *Focus in High School Mathematics: Reasoning and Sense Making* where they advocated for the high school mathematics curriculum to be designed around opportunities for students to reason and make sense of important mathematical concepts (NCTM, 2009). Often we take for granted that our mathematically talented students—those students who show both a propensity for and genuine interest in mathematics and can think creatively (Avineri et al., 2011)—are engaging in opportunities for reasoning and sense making by the sheer fact that they are sitting in honors-level or Advanced Placement mathematics courses. With the focus of state standards and assessment projects on ensuring that a common core of mathematics is achieved by all students, there has been less discussion by educators about the mathematics education of mathematically talented students. Here are a few things to consider about the opportunities for these students: for one, AP Calculus courses are designed to replicate the average college-level calculus course and not designed to address the needs of gifted students (Avineri et al., 2011). Similarly, advanced students who have completed all of the mathematics courses that a high school has to offer may be funneled into college-credit bearing courses at a nearby college campus. Again, these courses are not necessarily designed to build on the creativity or the mathematical ability of talented students. In both situations, these students are exposed to more advanced mathematics, but not necessarily given the opportunity to explore, be creative, develop interest, reason and make sense of important mathematics.

What Is the Goal?

However, what is the goal for the mathematics education of mathematically talented high school students? Should the goal be to allow these students to take as much mathematics as possible so as to prepare them for their future careers as scientists and mathematicians? For one, as Barbeau (2011) points out, even gifted students may not be ready to take on the advanced content offered in advanced, collegiate mathematics. Secondly, these mathematically talented

students, the ones that we hope will go on and become our nations' next generation of scientists, are not necessarily choosing to go into these fields, nor are they adequately prepared to do so in many cases. At the university level, we continue to see a decrease in the number of students majoring in mathematics-intensive majors (Broussard, 2011) despite the increase in the number of students enrolling in AP Calculus classes (Broussard, 2010). There are fewer and fewer students interested in mathematics or related fields, but also fewer that are adequately prepared to complete the rigorous courses that these majors entail. The President's Council of Advisors on Science and Technology has determined that about 40% of college students with intentions of majoring in engineering and science end up switching to other subjects (Adkins, 2012).

At a collegiate-level, mathematics, natural science, and engineering programs are concerned because the lack of interest or preparedness of college students and the resulting low number of majors can mean the closing of a collegiate program. For example, in 2011, Texas higher-education officials announced plans to close physics programs in Texas universities where the number of majors was dwindling (Reich, 2011). At a state and national level, political leaders underline the importance of increasing STEM majors for the future of our country and our ability to lead in technological and environmental innovations. The opportunities that we provide to high school students, particularly, mathematically talented high school students becomes all the more important within this context. Not only do we want to prepare students to be successful as STEM college majors, but we want to attract them to a future in these fields, as well.

To both prepare and attract students to mathematics, high school mathematics classrooms must be places where mathematically talented students have opportunities to truly engage in the work of mathematics—the question posing, the exploring, the false starts as hypotheses are introduced, designing strategies, solving problems, and finally, informally and formally justifying conclusions. Researchers and practitioners (Avineri et al., 2011; Barbeau, 2011;

Leiken, 2011) have suggested best practices with regards to providing advantageous opportunities for mathematically talented students. In particular, mathematics classrooms for mathematically talented students must provide the following:

1. Opportunities for creative thinking and for students to “use their own minds” (Avineri et al., 2011)
2. Opportunities for students to struggle with mathematics and rethink what it means to be “good” in mathematics (Avineri et al., 2011; Leiken, 2011)
3. A classroom environment where students feel supported and encouraged to take risks

Allow Opportunities for Creativity

Mathematically talented students should be given plenty of opportunities to think creatively in the mathematics classroom (Avineri et al., 2011). Current education practices have been criticized for not making creativity a priority and consequently not developing creative thinkers. Sir Ken Robinson has a famous TED talk (Robinson, 2006) where he laments how students begin schooling as creative thinkers but are educated out of it during the K-12 schooling experience. Being creative and learning to take risks with new ideas are important for future leaders and innovators. A common misconception is that creativity is strictly for fine arts or social science fields, and certainly not for mathematics. However, creativity is an important part of the professional work of mathematicians, whose careers depend on their being able to discover and then solve new problems (Subotnik et al., 2009). High school mathematics, particularly problem solving, provides great space for creativity. With good, open-ended mathematical tasks that do not have an immediate answer and that demand that students experiment, explore, and think deeply about important mathematics, all students, but especially mathematically talented students can be creative thinkers. Take the following problem from NCTM’s Focus in High School Mathematics (2009, p. 23).

Which of the following would save more gas fuel?

- a) Replacing a compact car that gets 34 miles per gallon (MPG) with a hybrid that gets 54 MPG.
- b) Replacing a sport utility vehicle (SUV) that gets 18 MPG with a sedan that gets 28 MG.
- c) Both changes save the same amount of fuel.

This problem, based on a New York Times article, provides space for students to use a variety of approaches and their own thinking. For example, one student could approach the problem by looking at a percentage increase in miles per gallon between the less fuel-efficient car and the more fuel-efficient car in each scenario. Approaching the problem this way leads the student to suggest that the first option is optimal. However, if a student takes a fixed distance over which the two vehicles travels, say 100 miles, and looks at which car uses the most gas, then the second option is better. Both solutions are valuable and are correct depending on the way you interpret the problem. Rich discussion can ensue about the different ways that students approached the problem. This problem does not have one obvious single answer. Students are not guided to a quick solution—but rather, must make assumptions based on their own understanding of the problem and the context to come up with a reasonable solution. In addition, depending on how the teacher sets up the task, there are rich opportunities to analyze and discuss other solutions and defend their own position. This problem was included, not because of the high-level mathematical topics it covers—NCTM (2009) makes clear that this is a problem appropriate for all students in first-year algebra. Rather, it is a good example of the types of tasks that we want for mathematically talented students, as it does allow for creative thinking.

Allow Mathematically Talented Students to Struggle

It is important to provide mathematically talented students with opportunities to struggle with important mathematics (Avineri et al., 2011; Leiken, 2011). As Leiken (2011) points out “Mathematical challenge is a necessary condition for realization of mathematical potential” (p. 181). However, this can be uncomfortable for high school students who have historically been very good in mathematics. Mathematically talented students may have a strictly defined idea of what it means to be “good” in mathematics. If they have performed successfully for years in mathematics classrooms—doing well on homework and tests and knowing the answer to a question posed by the teacher during class—they might be less comfortable taking risks and exploring mathematics where the answer is not immediate or there is no clear algorithmic approach to finding the

solution (Avineri et al., 2011). In 2000, the National Research Council, in their publication *Adding It Up* asserted the importance of students developing a productive mathematical disposition. For students to be proficient in mathematics they must come to view mathematics as a useful endeavor connected to their lives. They must also believe in their own ability to “do” mathematics and be diligent in their efforts. If we want mathematically talented students to develop a productive mathematical disposition (NRC, 2000) and be prepared for collegiate mathematics and careers or post-graduate schooling in math-related fields, then we want them to view understanding and learning as the true goal of mathematics class. Being good at mathematics becomes less about grades and not making mistakes and more about exploring and engaging in good mathematical tasks, persisting despite struggle and eventually understanding mathematical concepts more fully. Teachers of mathematically talented students must help these students who are less willing to take risks to become appreciative of mathematical investigation and opportunities for mathematical growth.

One important way for teachers to support these students is to allow them to struggle mathematically while providing support. The following is an excerpt from observation data collected from an honors pre-calculus classroom. The students in Mrs. Avery’s high school class, familiar with the graphs of sine, cosine, and tangent, were graphing different transformations of the standard trigonometric functions. Based on their exploration with the graphing calculator, they were to generalize about which coefficients in the equation enacted particular transformations of the parent function. The students had done a similar activity earlier in the semester with polynomial functions. What follows is a transcript of what happened in her class.

At the beginning of the class, Mrs. Avery introduced the activity.

Mrs. Avery: I want to look some more at trig functions but I want you to look at trig functions first. So for the rest of the class period, we’re going to analyze some trig functions. You may work with a partner.

Students moved to their new seats to work with a partner. Mrs. Avery walks around to each group. She stops at Terrilyn’s desk.

Terrilyn: I don’t know....I don’t see it.

Mrs. Avery: Okay, so what are we looking at as you look at different functions? What’s the big topic of what we are applying to trig functions right now?

Terrilyn: What do you mean the bigger picture?

Mrs. Avery: Uh huh. We’ve done some of these things with functions before? Keep thinking on that as you move through the questions. Think about where have you seen some of these types of things before when we studied functions. Because it’s going to relate back to something else that we’ve done already.

Terrilyn (*quiet for a few seconds*): I don’t know....

Mrs. Avery (*goes to the board and writes* :

$$f(x) = x^2 \quad \text{and} \quad f(x) = -(x - 3)^2 + 5$$

Mrs. Avery: What do we know about these two graphs?

Terrilyn: Umm...we know that that second graph is going to be a parabola, but opening down, shifted to the right? And up?

Mrs. Avery: (*draws the two graphs on the board*): So at the end of the activity, I want to be able to put up a trig function and you should be able to tell me what the graph looks like—just like you did for the quadratic.

Terrilyn: Got it!

Mrs. Avery: Got it?

Terrilyn (*excitedly*): Yes!

Mrs. Avery supported the students when they needed it, but without giving them answers or leading them too, much. In our interview after the classroom episode, Mrs. Avery talked about this:

It [the honors class] is very rigorous. I don’t tell them a whole lot. I ask them a lot of questions and I want them to figure it out. Um, I like to leave things just kind of hanging out there [laughs]. And they hate it but they learn from it.

Often as teachers, we do not want our students to be upset or give up—we want them to be successful. Helping them too much is an easy trap to fall into—especially with students that we deem to be under a great deal of pressure to succeed, like many mathematically talented students. However, allowing them to struggle with the mathematics not only allows them to learn more, but it also teaches them diligence and promotes self-confidence.

Create a Safe Classroom Environment

A classroom environment where mathematically talented students feel safe taking risks and are not penalized for struggling with mathematics is central to these students’ mathematical success.

Mathematically talented students, especially those that are focused on getting good grades and the correct answer must be encouraged to see that there is value in not knowing the answer immediately and that taking time to find the answer through false starts is important to mathematical learning. Classrooms where the focus is on moving through mathematical content quickly can give the students the wrong message about what being “good” in mathematics means. Such a focus can also be detrimental to the self-esteem and mathematical disposition of students, particular female students. Hallam and Ireson (2007) studied students’ feelings about their placements in tracked high schools (that is, secondary schools that group students by ability levels in courses labeled Advanced, Honors, College Preparatory or AP and Regular, Traditional, etc.) and found that, in particular, female honors students were more likely to want to move to a lower-track mathematics class. Reasons for wanting to move to the lower-track included feelings that the higher-track classes were too fast paced (Boaler, Wiliam, and Brown, 2000), students were expected to know the mathematics without much support from the teacher, and the pressure was too intense (Hallam and Ireson, 2007). These students felt that if they moved to a lower-track mathematics course then they would have more time to understand the mathematics and they would receive more guidance from the teacher. These findings are particularly troubling because historically mathematics has been a male-dominated field and we do not want to further alienate female students from taking advanced mathematics, majoring in mathematics-related fields in college, and ultimately choosing careers that use mathematics.

To foster a productive mathematics classroom environment for mathematically talented students the teacher has to establish the expectation that mathematics is not meant to be done quickly and that there is important value in struggle. Mathematically talented students will become more comfortable with this idea of struggle if they see their classmates struggle. To ensure this, mathematically talented students should work collaboratively on thought-provoking mathematical problems (Avineri et al., 2011). Validating multiple approaches to solving a problem is important, even those approaches that are

incomplete or in the wrong direction. If the teacher incorporates a variety of strategies in the discussion of a problem and indicates what can be learned from even the incorrect approaches, students will feel that all contributions are important and will be more likely to take risks with their own approaches.

Conclusion

Mathematics classroom environments that capitalize on the strengths of mathematically talented students while supporting them as they grow to be stronger and confident mathematics students is important for their success. As a field, we spend less time worrying about these students because mathematically talented students are often regarded as those who will succeed regardless. However, recent data and research suggest that these students need support, encouragement, and opportunity for real growth so that they continue to be successful mathematically in college and hopefully in future career endeavors. The decreasing number of college students majoring in mathematics-related fields puts increased pressure on high school mathematics teachers. With fewer students taking advanced mathematics in college, the opportunities for mathematically talented students to experience the work of mathematics and to develop both interest in and a disposition for mathematics will have to take place in the high school classroom. As such, it is crucial that mathematically talented high school students truly have opportunities for creativity, authentic struggle, and exploration of mathematics during their high school mathematics education.

REFERENCES

- Avineri, T., Belliden, C., Graves, J., Noble, R., Hernandez, M., Robinson, D. and Teague, D. (2011) Issues of equity for advanced students. In M. Strutchens and J. Quander (Eds.), *Focus in High School Mathematics: Fostering Reasoning and Sense Making for All Students* (65-81). Reston, VA: NCTM.
- Barbeau, E. J. (2011). Gifted Students and Advanced Mathematics. *Montana Mathematics Enthusiast*, 8(1/2), 319-328.

Boaler, J., Wiliam, D., & Brown, M. (2000). Students' Experiences of Ability Grouping - disaffection, polarisation and the construction of failure. *British Educational Research Journal*, 26(5), 631-648. doi:10.1080/01411920020007832

Bressoud, D. (2010). Meeting the challenges of high school calculus: Evidence of a problem. Launchings. MAA Online. Retrieved from http://www.maa.org/columns/launchings/launchings_04_10.html on September 29, 2012.

Bressoud, D. (2011). Status of math-intensive majors. Launchings. MAA Online. Retrieved from http://www.maa.org/columns/launchings/launchings_02_11.html on September 29, 2012.

Hallam, S., & Ireson, J. (2007). Secondary school pupils' satisfaction with their ability grouping placements. *British Educational Research Journal*, 33(1), 27-45. doi:10.1080/01411920601104342.

Leikin, R. (2011). The education of mathematically gifted students: Some complexities and questions. *Montana Mathematics Enthusiast*, 8(1/2), 167-188.

Mathematics Learning Study Committee, National Research Council (2001). *Adding It Up: Helping Children Learn Mathematics*. Washington, DC: The National Academies Press.

National Council of Teachers of Mathematics (2009). *Focus in high school mathematics: Reasoning and sense making*. Reston, VA: NCTM.

Reich, E.S. (2011). Texas holds firm on physics closures. *Nature*. Retrieved from doi:10.1038/news.2011.559.

Robinson, K. (2006, February). Ken Robinson says schools kill creativity. *Ted Conferences*. Podcast retrieved from http://www.ted.com/talks/ken_robinson_says_schools_kill_creativity.html.

Subotnik, R. F., Pillmeier, E. & Jarvin, L. (2009). The psychosocial dimensions of creativity in mathematics: Implications for gifted education policy. In R. Leikin, A. Berman & B. Koichu (Eds.), *Creativity in mathematics and the education of gifted students* (pp. 165-179). Rotterdam, the Netherlands: Sense Publishers.



Judith Quander • <quanderr@uhd.edu>
Assistant Professor • The University of Houston-
Downtown

8 coins in quarters and
nickels worth \$1.80

**Nasco would like to help
S-T-R-E-T-C-H your Budget!**

Use coupon code **9800650**
to receive **10% OFF** and **FREE shipping**
on your next math order
of **\$50.00 or more**
Expires 12/31/13

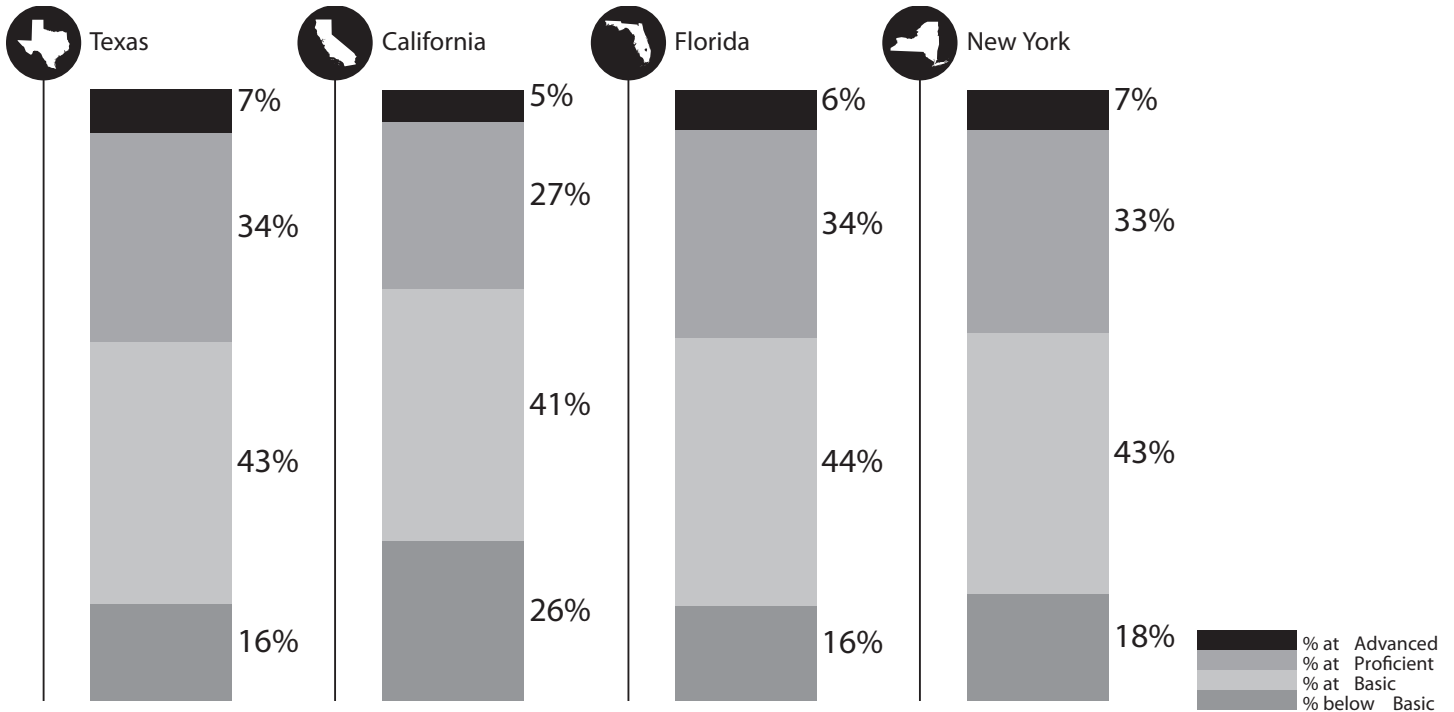
**Demonstration Rekenrek
& Student Rekenrek**
TB22820 & TB22807

Call or visit us online to request a **FREE** catalog!
1-800-558-9595 • eNasco.com/math

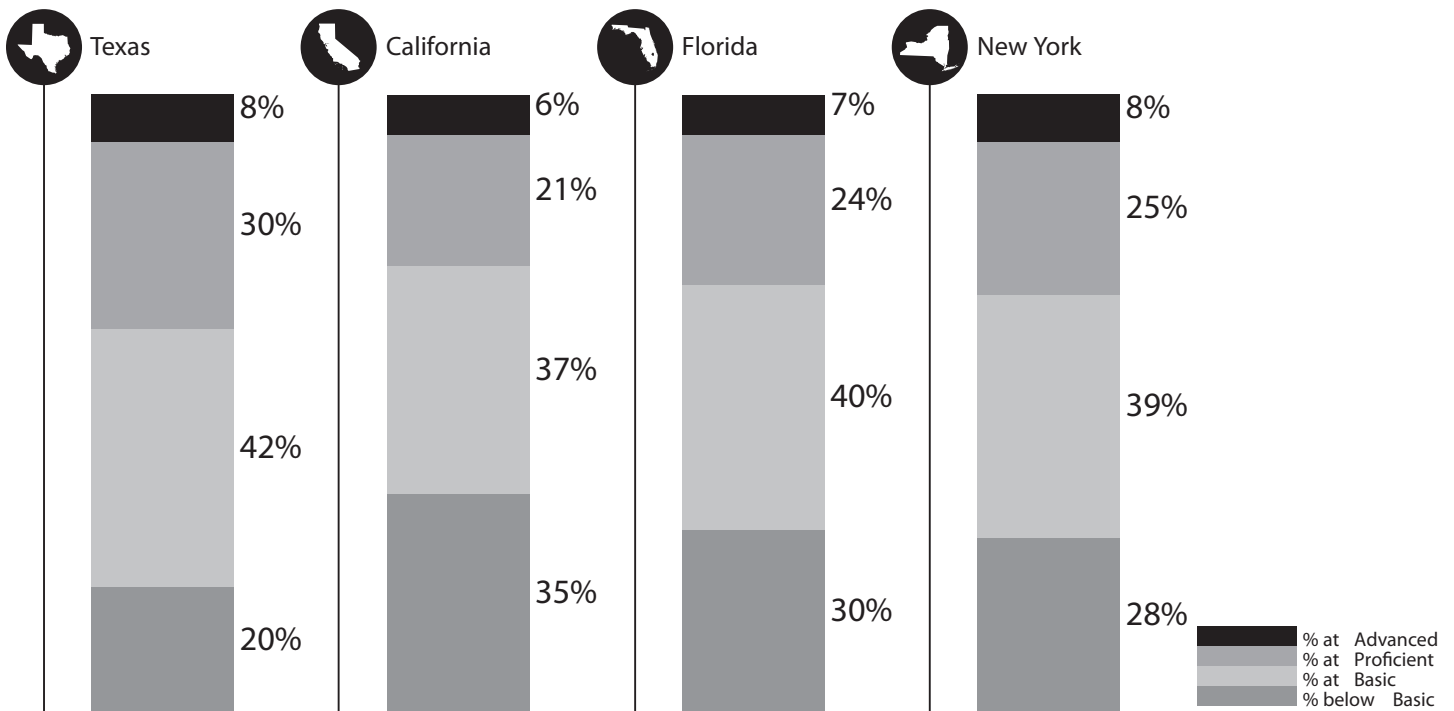
Scan the code for more info

How do the four largest states compare by performance groups?

Achievement-level results in NAEP mathematics for fourth-grade public school students: 2013



Achievement-level results in NAEP mathematics for eighth-grade public school students: 2013



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2013 Mathematics Assessment. < nationsreportcard.gov/reading_math_2013/#/state-gains >

Voices from the Classroom

The Many Travels of Pythagoras

A geometry class seamlessly integrates literature and world history

Interdisciplinary instruction is not new. It has been around for many years but has been most prevalent in elementary classrooms. The practice of integrated instruction is meant to help students make connections between content areas and to make the concepts relevant (Parisot, 2009). The integration of content is meant to be seamless, as though there were not one or more specific content areas being taught (Meyer, Stinson, Sheats Harkness, & Stallworth, 2010). Along with providing relevance, integrated instruction may also bring motivation.

We wanted to create and implement a lesson that would motivate students while integrating two core content areas with literature. Our audience was Ms. Foy's high school geometry classroom; our chosen book was *What's Your Angle, Pythagoras? A Math Adventure* by Julie Ellis. We followed the BSCS 5E Instructional Model (Bybee et al., 2006). After reviewing the book and Texas Essential Knowledge and Skills (TEKS), we chose to integrate World History into the lesson. The implemented Student Expectations were:

- Geometry 5(D) Identify and apply patterns from right triangles to solve meaningful problems, including special right triangles (45-45-90 and 30-60-90) and triangles whose sides are Pythagorean triples
- Geometry 8(C) Derive, extend, and use the Pythagorean Theorem
- Geometry 11(C) Develop, apply, and justify triangle similarity relationships, such as right triangle ratios, trigonometric ratios, and Pythagorean triples using a variety of methods
- World History 16(C) Interpret maps, charts, and graphs to explain how geography has influenced people and events in the past.
- World History 27(E) Identify the contributions of significant scientists such as Archimedes, Copernicus, Eratosthenes, Galileo, Pythagoras, Isaac Newton, and Robert Boyle.

For those who have never read one of the children's books by Julie Ellis, you're missing out on some fun, fictional stories with great mathematics topics. To give you an overview of *What's Your Angle, Pythagoras? A Math Adventure*, it's the story of a curious young boy named Pythagoras. The story is set on the island of Samos in ancient Greece. The boy travels the seas with his father, a merchant, and meets someone who gives him an unusual piece of knotted rope. The young Pythagoras learns how to use the rope to make right triangles, which helps the builder make straight corners. The boy's curiosity causes him to be scolded as he messes with colored tiles and creates squares around a triangular statue base. As Pythagoras reflects upon his experiences he discovers an amazing pattern, which he uses to fix several issues that have arisen at his home. Of course, each of these issues is a lesson in the use of the Pythagorean Theorem.

What follows is the lesson as it occurred in Ms. Foy's Geometry classroom.

Let's Engage through Literature

The lesson began with the instructor reading the first seven pages of *What's Your Angle, Pythagoras? A Math Adventure* to the class. The instructor asked the following questions:

- What affect does a crooked column have on a building?
- Why are the Greek columns crooked?
- How could the bases be built so the columns would not be crooked?

A brief discussion followed about the school structure and how crooked beams and/or columns might affect it. The instructor continued reading the text (pages 8 – 15) to the class. This is the point in the text in which the young boy, Pythagoras, receives a special rope from a master builder. The builder has explained his use of the rope to make special (right) triangles to "make a nice, square corner that's exactly the right angle" for his buildings.

Materials & Preparation

Prior to the exploration portion of the lesson, materials were needed. The instructor prepared, in advance, a "knotted rope" for each group of students. It was created by cutting 62 inches of yarn and tying the ends together using approximately one inch on each end. This created a circle with a sixty-inch circumference. Then, small pieces of masking tape were "marked" or placed at every five-inch interval. This formed a circular piece of yarn with twelve equally spaced "knots."

The supplies needed for each "knotted rope" included 62 inches of yarn per group, masking tape, and a ruler (or meter stick). Additional materials will be needed for each group of students, including one protractor, one ruler (or meter stick), varying amounts of yarn (or string), and masking tape. Lastly, a map of ancient Greece is needed. We would suggest asking your social studies teacher for one that is used in the World History curriculum.

Exploring with Hands-On Activities

Next, students were given a "knotted rope," similar to the one used by young Pythagoras, with which to explore. Their instructions were to use the rope to make one or more right triangles. They recorded their observations, which included a minimum of one drawing. They were instructed to include the location of each "knot" and the measure of each angle created. The students compared and discussed their results with neighboring groups. Students were asked the following questions:

- How many examples did you come up with?
- How many of those examples had a "knot" at each vertex? How many did not?

- Explain how your triangles vary from your neighbors.

Let's Explain through Literature

Following the realization that there could be many right triangles formed but only one right triangle with knots at each vertex, the instructor explained Pythagorean Triples and gave some examples. The instructor read the remaining pages (16 – 31) of the text, which included details of the Pythagorean Theorem and its use by the young boy. In addition, this portion of the text includes examples of how the theorem and right triangles may have been used in ancient Greece. The instructor reinforced the theorem and gave a demonstration on how to work problems using the theorem.

Create New Varieties to Elaborate

Students were then tasked with creating their own “knotted rope” that could be used by someone wanting to create a Pythagorean Triple right triangle (as in the story). Students were not allowed to create any of the sample triangles used in the previous explanation piece. Students were to record their measurements and use the Pythagorean Theorem to prove their triangle was a correct triple. Each group shared how they created their “knotted rope” and proved it was a Pythagorean Triple.

The Historical Notes

The instructor read the “Historical Note” on page 31 of *What's Your Angle, Pythagoras? A Math Adventure* to the class. The information in this section of the text includes the fact that Pythagoras was born around 569 BCE and that he was many things, not just a mathematician. Students responded to the following questions:

- In the book, how did Pythagoras' information help his father?
- How might that information have helped other travelers during that time frame?

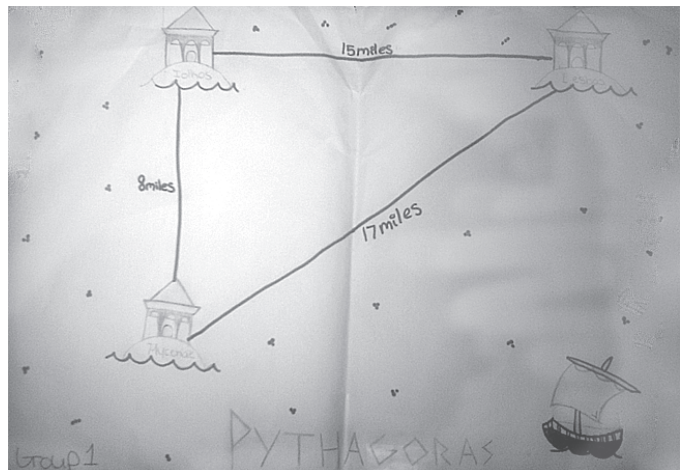
Discussions followed which included the usefulness of the Pythagorean Theorem.

Let's Evaluate with Ancient Maps

Next, students were expected to use a map of ancient Greece, which corresponded to the approximate time in which Pythagoras lived, to demonstrate their knowledge of the Pythagorean Theorem. In addition, students were expected to discuss and summarize how geography and the contributions of Pythagoras might have influenced people and events of the past.

Student groups were given a choice between one of two projects. The first option consisted of a group problem solving strategy. Group members were given specific roles and tasks in helping solve a word problem involving travels in ancient Greece. They were expected to present their solution to the class. The second option consisted of student groups creating a visual demonstration for solving one of the word problems, involving similar travels in ancient Greece, and presenting to the class. The students who chose option two could perform their demonstration

via a commercial, rap, jingle, skit or another pre-approved format. All student groups were given a rubric with expected outcomes for the content of their presentations. Group presentations were completed and evaluated.



The projects and rubric mentioned above are posted on the TCTM website:

www.tctmonline.org/TMT_archive/TMT_2010s_archive.html
under Geometry Project "What's Your Angle, Pythagoras?"

Concluding Remarks

Not surprisingly, the students enjoyed this lesson. It was different from other math and history lessons most of them had experienced. Some of their comments included “I like the hands-on activities,” “it was exciting to see how geometry and social studies can be combined” and “[it] helped me to gain a better understanding of the Pythagorean Theorem.” We believe the students came away with a deeper understanding of the uses of the Pythagorean Theorem and the significance of its use in our world. Although the planning process for this lesson was more time consuming than a typical Geometry lesson, the benefits and effectiveness of the content and literature integration were worth it.

REFERENCES

- Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Carlson Powell, J., Westbrook, A., & Landes, N. (2006). *The BSCS 5E Instructional Model: Origins, effectiveness and applications*. Retrieved from <http://www.bscs.org/bscs-5e-instructional-model>
- Meyer, H., Stinson, K., Sheats Harkness, S., and Stallworth, J. (2010). Middle grades teachers' characterizations of integrated mathematics and science instruction. *Middle Grades Research Journal*, 5(3), 153 – 167.
- Parisot, Arlene. (2009). Integrated instruction – framework, value, process, results. *The Teaching and Learning Compact*, Spring 2009. Retrieved under resources from: <http://www.ttlcompact.org>


Michelle Foy • Student
University of Texas at Tyler • mfoy@patriots.uttyler.edu

Nancy Rodriguez • Student
University of Texas at Tyler • nrodriguez3@patriots.uttyler.edu


2013-14 Mathematics Pre-service Teacher Scholarship Awardees

Six Texas students were awarded the \$2000 TCTM Mathematics Specialist Scholarship for 2013-14. 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.

Morgan Elyse Boudreaux
University of Mary Hardin-Baylor



Katrina Lynn O'Bryan
Tarleton State University




Audra Nell Cozart
Tarleton State University



Mayra Patino
Tarleton State University



Kelsey Shae Janis
University of Mary Hardin-Baylor



Amy Mae Story
Baylor University



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 2014, please download the forms from our website. Please submit your nomination by Dec. 31, 2013.**

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



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 May 2, 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.



NCTM 64th Delegate Assembly

April 18, 2013

Denver, CO

The sixty-fourth annual NCTM Delegate Assembly, held in Denver, began with an introduction of the NCTM board of directors followed by the president's report. Leadership circle members were recognized, as was one new NCTM student affiliate from Slippery Rock University. Only one proposed resolution came to the floor and did not pass. The Eastern Caucus recommended to the NCTM Board of Directors to consider including members who are not mathematics teachers when calculating the percentages of an affiliate's "members" for the Leadership Circle. The resolution further explained that non-mathematics persons such as special education, science, and social

studies attend mathematics-related conferences where affiliate's membership dues are part of the conference fee. The resolution failed by a vote of 34-38 as the Delegate Assembly felt that the calculation for the Leadership Circle should not include members who are non-mathematics teachers or who do not intend to become members of NCTM.

Veronica Galvan • NCTM Representative
• <galvan_veronica@yahoo.com>



PAEMST

Presidential Awards for Excellence in Mathematics and Science Teaching

Eight Texas teachers have been named finalists for the 2013 **Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)**. The 2013 awards recognize seventh through twelfth grade mathematics and science teachers whose innovative methods bring teaching to life in the classroom. The Texas finalists in secondary math are Jessica Caviness from Coppell ISD, Amy Ferguson from North East ISD, Penny Smeltzer from Round Rock ISD, and Ruth Westbrook from Denton ISD.



Jessica Caviness



Amy Ferguson



Penny Smeltzer



Ruth Westbrook

PAEMST is the highest recognition that a mathematics or science teacher may receive for exemplary teaching in the United States. The National Science Foundation administers PAEMST on the behalf of The White House Office of Science and Technology Policy. To achieve recognition through this program, a teacher first must be nominated for the award. A state panel of master teachers, specialists, and administrators reviewed the applications and chose the most outstanding mathematics and science teachers for the

National Science Foundation to consider for state finalist status.

After the initial selection process at the state or territorial level, a panel of distinguished scientists, mathematicians, and educators may select one mathematics and one science teacher from each state and U.S. jurisdiction for the national award.

National award winners will be announced during the summer of 2014. PAEMST winners receive \$10,000, a citation signed by the President of the United States, and a paid trip for two to Washington, D.C. to attend recognition events and professional development opportunities.

Texas state finalists are recognized annually by the State Board of Education at its January meeting.

Outstanding mathematics and science educators teaching in grades K-6 with five years or more of teaching experience are eligible to apply for the 2014 award. Nominations and applications are now being accepted, and close on April 14, 2014. For more information, please visit <<http://www.paemst.org>>.

Texas Education Agency Contacts: Jo Ann Bilderback and Irene Pickhardt (512) 463-9581

CAMT Board Report

To all who attended CAMT 2013 in San Antonio, thank you so much! It was great seeing each of you. The CAMT Board is already busy making plans for CAMT 2014, which will be held July 21-23, 2014, in Fort Worth. This will be the first time that CAMT has been in Fort Worth, and we couldn't be more excited about the opportunities that this new host city presents!

At our August 2013 CAMT Board meeting, we made several important decisions that I'd like to take a moment and share with you.

First, we have adopted a new policy to become in better compliance with the Americans with Disabilities Act. We have a legal and moral obligation to make sure that our conference is accessible to all teachers, regardless of their abilities or disabilities, and the CAMT Board takes that obligation very seriously. The facility that we rent (usually a convention center or hotel) is responsible for making sure that all participants can access the spaces we use, including the use of elevators, wheelchair ramps, and other accommodations that are required by law. The CAMT Board is responsible for making sure that the program, or the content, of the conference is accessible to all participants. To that end, if you or a colleague requires a reasonable accommodation in order to attend the conference, we urge you to contact the CAMT office no later than 6 weeks prior to the start of the conference. That time allows us to make sure that we can secure the necessary accommodations in order to make sure everyone gets the most out of the CAMT experience.

Second, the CAMT Board has decided to defer speaker fees. So for CAMT 2014, all lead speakers will continue to have their registration fee waived. If you have additional speakers in the same session (after all, speaking is more fun with a friend!), then the additional speakers will still need to register and pay for the conference.

Looking ahead to CAMT 2014...

Our Program Chair, Kay Neuse of Plano ISD, has been busy with her committee preparing a slate of top-notch featured speakers! See page 14 or visit the CAMT website, www.camtonline.org, for the latest updates on featured speakers, including links to more information and video clips from their other presentations.

Some conference highlights:

- Participant registration for CAMT 2014 will open on February 1, 2014. Visit our website, www.camtonline.org, for details about how to register.
- Earlybird registration, from February 1 until May 1, will be \$155.
- Onsite registration will be \$220.
- We will have complimentary Internet access throughout the Fort Worth Convention Center! Please make sure to take advantage of this opportunity and bring your mobile device to make the most of your CAMT 2014 experience.

You can sign up to volunteer by contacting our Volunteer Chair, Kelly Meshell, of Austin ISD. Kelly's contact information is on page 14 as well as the CAMT website.

Don't forget to "like" CAMT on Facebook and to follow us on Twitter with our username [@camttweets](https://twitter.com/camttweets). These are the best ways to keep current with important news and events regarding CAMT 2014. On Twitter, use the hashtag #camt14 to tweet about CAMT 2014.

Get out your smartphone and scan the QR codes below to link directly to CAMT on Facebook or Twitter right now!

Like CAMT on Facebook!



Follow CAMT on Twitter!



The CAMT Board and I look forward to seeing you in Fort Worth next July, where we will gather to *Rebrand Mathematics!*



Paul Gray, Ed.D. • pgray73@sbcglobal.net
CAMT Board President • Houston, TX

\$2.45 in quarters and
dimes using 17 coins

Voices from the Classroom

Three Things That a Campus-Based Mathematics Leader Should Know

Math is not my favorite subject. I was never good at math. I wish I could just teach reading all day. These were some of the comments that were made to me as a new Mathematics Peer Facilitator on my campus. I quickly realized that one of my main goals was to help change teachers' attitudes towards math. Before I could accomplish that goal, I concluded that there were three main things that I needed to do as a campus-based mathematics leader.

Identify campus mathematics needs

As a new Mathematics Peer Facilitator, I needed to identify the growth obstacles in the mathematics program on my campus. I formed a Math Committee with a representative from each grade level. During our meetings, we discussed the skills that students struggled with the most and collaboratively created suggestions for improvement. After each district mathematics benchmark assessment, I met with each team to analyze and disaggregate assessment results. The conversations we had might have been uncomfortable at times because the conversations required teachers to reflect and verbalize the areas in which their students were experiencing the most challenges. I used the information gleaned from these meetings to set up peer observations, purchase resources, and develop professional development sessions.

Know your grade level TEKS

As a campus mathematics leader I need the teachers to believe that I am knowledgeable and competent so they will be open to the instructional strategies that I am sharing. Understanding student expectations (SEs) is necessary in order to provide support to the teachers and grade-level teams. I keep a binder for each grade level that contains a copy of the mathematics TEKS, our district curriculum guides, and other relevant documents that I reference

on a daily basis. As a Mathematics Peer Facilitator I met with each grade-level team on my campus (PK-4th) on a weekly basis as they planned their lessons. I helped each team make sure that the activities and resources they were incorporating in their lessons aligned to the grade-level TEKS. Sometimes teams questioned why they had to teach certain SEs or why students might not know concepts that they thought were taught in the previous grade level. I was able to explain and provide examples of how a specific SE is the foundation for an SE in other grade levels. I was also able to clarify what concepts and skills their students should have and what they can expect the students to be able to do.

Understand grade-level team dynamics and knowledge

Who is the mathematics leader on the team? What is the level of mathematical understanding of each teacher? Which teachers have low self-confidence regarding their math teaching ability? It is important to be able to determine how a team functions in order to figure out how to best approach each team with school-wide and district initiatives.

The bottom line is that in order to make a positive impact on my campus, I had to get to know the staff on my campus and deepen my mathematical knowledge. It was necessary to take the time to form relationships with grade-level teams in order for us to be able to work collaboratively. I had to make the time to read professional books and attend staff development sessions to improve my own understanding of the PK-4th mathematics TEKS.



Cindy Garcia • Mathematics Peer Facilitator
South Houston Elementary • <cgarcia@pasadenaisd.org>

Recommended Readings and Resources

Why Can't I Have EVERYTHING? Teaching Today's Children to be Financially and Mathematically Savvy

by Jane Crawford

ISBN: 978-1-935099-25-3

Publisher: Math Solutions/Scholastic

This is a practical and timely resource, written by a 1993 recipient of the Presidential Award for Excellence in Science and Mathematics Teaching, that offers teachers over forty lessons for teaching young students to be financially literate while concurrently integrating mathematical concepts such as counting, number sense, coin recognition, place value, estimation, and solving word problems. Each of the seven chapters addresses an important question for young children: What is money?, Where do we get our money?, Do we have enough money?, Why can't we have everything?, How do we earn money?, Should we spend, save or share?, and Where do we keep our money? It presents

these accessible, engaging lessons by way of hands-on activities, children's literature and thinking about figures of speech about money such as 'saving for a rainy day.' This resource is aligned to the Common Core State Standards in Mathematics which makes a useful connection to our Texas TEKS. *Why Can't I Have EVERYTHING?* will be an important resource for all primary teachers of mathematics.



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

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. If you wish to view past issues, please see

www.tctmonline.net

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*.

The Editorial Board wishes to acknowledge the contributions - time, effort, and expertise - that our volunteer reviewers make to our final journal. Those that reviewed for the journal and deserve our thanks for their support last year, in 2012-13, were:

Jackie See, Kelly Meshell, Beth Glassman, Jeri Bonnell, Ramona C Davis, Beth Grayson, Elaine Young, Christine Peters, Shere Salinas, Richard Parr, Sandra Hawkins, Trena Wilkerson, Sandi Cooper, Bill Luke, Sarah Ives, Jenn Garner, Kay Olds, Winter Wilks, Veronica Hernandez, Brette Garner, Shannah Hoffman, and Paul Gray.

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, Kathy Hale. 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

Dr. Cynthia L. Schneider	Editor	cschneider@utexas.edu	Dr. James Epperson	Board Member
Geoffrey Potter	Layout	state-monkey@austin.rr.com	Dr. Larry Lesser	Board Member
Mary Alice Hatchett	Director	mahat@earthlink.net	Katey Arrington	Board Member

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

Permission is granted to reproduce any part of this publication for instructional use or for inclusion in a Texas NCTM affiliate publication provided that it is duplicated with full credit given to the authors and *Texas Mathematics Teacher*.

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 Biels	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 (CAMT) 2014 will be held July 21-23, 2014, at the Fort Worth Convention Center in Fort Worth, Texas. Take advantage of early-bird registration discounts before May 1.

The Elementary Administrators' Conference will be Monday, July 21 and the Secondary Administrators' Conference will be Tuesday, July 22. Both will be held at the Fort Worth Convention Center Arena. Registration to CAMT is complimentary to participants attending either of the Administrators' Conferences.


The logo features the words "REBRANDING" and "MATH" in a bold, sans-serif font. "REBRANDING" is positioned above "MATH", and both are slanted upwards to the right. A thick, dark horizontal bar is placed behind the text, creating a sense of depth and shadow.

Look inside for information on how to volunteer and a list of featured speakers.

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

The University of Texas at Austin
Texas Mathematics Teacher
Charles A. Dana Center
1616 Guadalupe, Suite 3.206
Austin, TX 78701

Nonprofit Org.
U.S. Postage Paid
Austin, TX
Permit #391



print name

Valid Through July 31, 2014

Membership Card

Mary Alice Hatchett President

Use the membership form online at <www.tctmonline.net> to renew or join TCTM for the first time.

If this journal is addressed to you, you are a current member of TCTM. Here is your membership card.