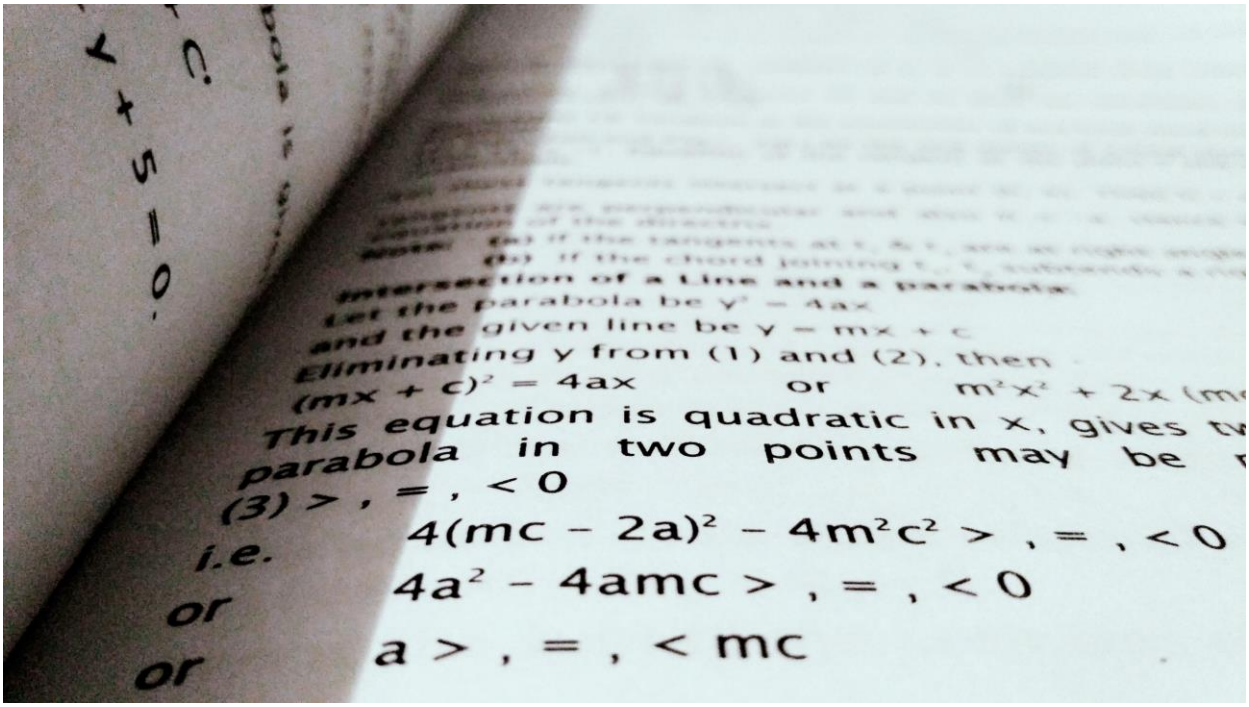
The Upper East Tennessee Council of Teachers of Mathematics



VOL 19, ISSUE 4

In This Issue:

UETCTM Meetings for 2018-19 Officers for 2018-2019:

Usual schedule: 4:00-4:45: Refreshments, announcements, business meetings, short presentations; 4:45-6:00: Programs for all levels.
Next Meeting: Thursday, March 14, 2019, Daniel Boone High School, Gray

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The Power of Positive Experience?
Amanda White

If your car engine needed to be rebuilt, would you drop your car at a repair shop that was advertising "Stop in Now! We have ZERO experience with rebuilding engines!"? NO! What if you decided you really wanted a pool in your backyard? Would you choose the pool company with years of positive reviews or the man who shows up with a shovel and a smile?

In scenarios like these, it is obvious that experience reigns supreme. All of us can see the benefit of having experience when looking to complete a task. One of the first questions a potential employer asks is for you to explain your experience in the area that you want to be hired for.

Why then, do we not embrace the idea of experience in young learners? As educators, we expect a great deal of the little learners that we spend our days with. We set out in August to stretch their brains and do the seemingly miraculous with each student. We strive to make each new Kindergartner a fluent reader and a competent mathematician in 10 short months together. The reality is this: we are teaching the smallest learners a very large amount of information in a very short amount of time and expecting immediate results. We want them to be successful. We want them to be happy. And let's face it, we wanna look good while they are doing it. ☺

I challenge that it all starts with experience. If we give them the tools they need to be successful and allow them to explore, play, touch, and build, they will build experience needed to truly learn and grow during their year with us. So it's time to pull out all the math manipulatives tubs you've got hidden in your room. Pattern blocks, linking cubes, colored counters, spinners, dice, teddy bear counters, dyed noodles, number cards made with glue, and all the other awesome things you made over the years. Lay them out around your classroom and give your students one instruction. EXPLORE! Then your job becomes simple. Let your kindergarten students follow your directions. Allow them to explore these math tools with no boundaries. Give them the freedom to let their imagination build the structure of this time. Watch as they have the opportunity to use these tools in ways that they see them as important, not with the guidelines that we put on them. The power of this time will build students that are strong in their confidence with a wide variety of tools that are – SURPRISE – perfect for building math proficiency and self-assurance with known and unknown math scenarios. Notice that I said it BUILDS students not teaches them. Now we are looking at allowing students to build and invest in their own knowledge base. And we all know that when students own their own learning experience, they learn and retain more information.

So do it! Lay out the tools of math and then sit on your hands for a little while. Observe with your eyes and ears as children use their voices, hands, and brains. Take the awesome opportunity to watch and learn as your students make connections, play, and grow their brains. It always astonishes me that what looks like play with children always includes great learning. We now have students that have built their own experience with math tools through play. Now we can throw new experiences with math into our classroom and watch as they grow and excel.

The Beauty of the Unit Circle

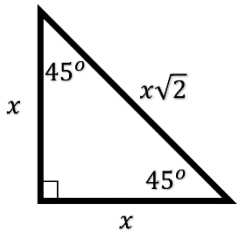
Cameron Buck

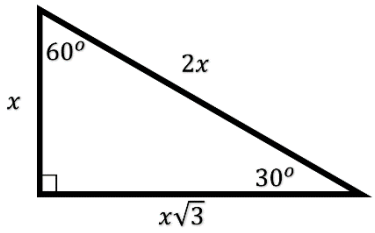
I never developed a great understanding of trigonometry when I was in school. In the class, I did my best to memorize what was asked of me and apply it, but it simply never made sense. I memorized SOH-CAH-TOA and could tell you those ratios if you gave me the side lengths of a triangle, but I was completely lost in terms of the unit circle and any relationship the trig ratios had. To me, the unit circle was just a series of points, degrees, and values of Pi. Memorization was difficult because I didn't know the underlying concepts behind it. To make things worse, after my trigonometry class, the unit circle seemed to kind of disappear and not be mentioned anymore in my math classes.

So you might imagine how I felt when, as a student teacher, I was told that I would be doing my EdTPA lessons on the Unit Circle, Trig Ratios, and Special Right Triangles. A great professor of mine once told me that if you struggle with something then you need to put yourself in a position where you're forced to use it and confront those struggles. With those words in mind, I became determined to figure out what the deal was with this unit circle and these trig ratios. And when I figured it out, it became a beautiful mathematical concept that I now love helping students with in their Algebra 2 and Trigonometry classes.

First, I'll start with what we referred to as special right triangles. These are our triangles with $30^o, 60^o,$ and 90^o angles or $45^o, 45^o$ and 90^o angles. These two diagrams show the ratios of the side lengths for those triangles.

As a reminder for those of us who may have not done trigonometry in a while, here are the three main trig ratios:





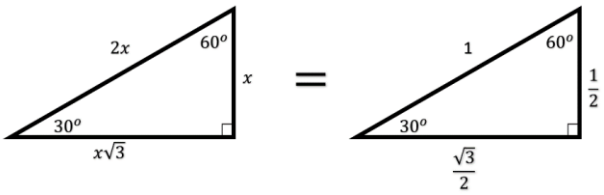
Sine of an angle = $\frac{side\ opposite\ the\ angle}{hypotenuse}$

Cosine of an angle = $\frac{side\ adjacent\ to\ the\ angle}{hypotenuse}$

Tangent of an angle = $\frac{Sine}{Cosine} = \frac{side\ opposite\ the\ angle}{side\ adjacent\ to\ the\ angle}$

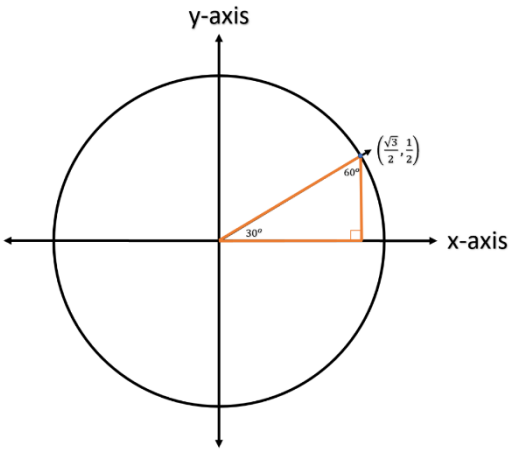
When I was preparing my lessons, I figured I would put in an exercise where the students would calculate those basic ratios using the side lengths of the special right triangles. When I worked the problems out on my own, the connections started hitting me.

We know that the radius of the unit circle is 1. If we draw one of our special right triangles with 1 as the hypotenuse, we can solve backwards for the other two side lengths. In the case of a 30-60-90 triangle, we get the following:



And now, we can apply those trig ratios. You see, when you take the sine of 30^o, you have a ratio of the opposite side, x, and the hypotenuse, $2x$. The x values cancel out, and you're left with $\frac{1}{2}$. The cosine has you take a ratio of $x\sqrt{3}$ to $2x$. Again the x values cancel out. You're left with $\frac{\sqrt{3}}{2}$. Look familiar? That would be the y and x values of 30^o on the unit circle, respectively. If you were to have a unit circle in front of you, placed a point at $(\frac{\sqrt{3}}{2}, \frac{1}{2})$, draw in a radius to it and a line straight down to the x-axis, you'd form that special 30-60-90 right triangle.

What about the tangent? It comes out to be $\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ after rationalizing the denominator. But how did it factor into things here? Well let's think about it. The



radius we drew in passes through the point $(\frac{\sqrt{3}}{2}, \frac{1}{2})$ and $(0,0)$. Using our slope formula, we see that the 0's don't matter, and we're left with the same work to do as when we originally found the tangent. That's right – the tangent is the slope of the line that passes through that point.

When I figured all of this out for myself, I was off to the races recreating my own unit circle. Only this time, I wasn't creating out of memorization and hope that I remembered things in the right order, but instead by taking the sines and cosines of those special right triangles. The first quadrant came easily. Then you simply rotate the triangle to have a side on the y-axis instead of the x-axis and add what you're missing. This is made easy because a 90^o angle (which the y-axis is when put with the x-axis), has a cosine of 0 and a sine of 1. This continued to lead me to the reflections that help to create the second, third, and fourth quadrants, as well as those tricky questions that asked what would happen if we went on past 360^o. For the first time, I was excited to do trigonometry.

I write this as a message to those teachers who teach the Unit Circle in Geometry, Algebra 2, Trigonometry, and beyond. If you are still asking your students to just memorize the unit circle and know those ratios, take a step back. Let them discover it rather than forcing it to them. Show them that the unit circle is a wonderful display of the beauty of mathematics. With a little algebraic manipulation, the unit circle forms itself, and it leads to a much clearer understanding of where points go and why. From these discoveries, let them discover the trigonometric identities. Simply being shown a list and told to memorize is difficult. There is no understanding being built. There is no reasoning behind it from the student's point of view. I promise you that they will learn and know these concepts on a deeper level if they discover it themselves.

Song and Dance in the Elementary Math Classroom

Erika Douglas

Math can be exhilarating for some and a huge struggle for others; therefore, song and dance can become an important part of education. Students can benefit from movement and song when learning new math concepts. With some extensive thought, teachers can transform popular songs to enhance student learning in their classrooms. In the early stages of learning, chants and claps are beneficial to learn patterns.

The Hand Jive is used in many elementary classrooms to demonstrate patterns because the dance repeats throughout the song, while each step is doubled. (Pat lap, pat lap, clap, clap, right hand over left, right hand over left, left hand over right, left hand over right, right fist on top of left, right fist over top of left, left fist over top of right, left fist over top of right, right thumb pointing over right shoulder, right thumb pointing over right shoulder, left thumb pointing over left shoulder, left thumb pointing over left shoulder, repeat...) Once the hand movements have been mastered and students no longer need prompting on the movements, chants and/or songs can be added to intensify learning of a new concept.

Teachers have access to the internet on a daily basis; therefore, if the teacher does not want to create their own song, YouTube has multiple songs and dances readily available for classroom use.
I have had success in my classroom by using both song and dance. My students often struggle remembering their multiplication tables and formulas to solve different problems. I try to turn the multiplication into songs and add movement to allow them with another way to experience math. Creating a song to use for multiplication numbers 1-12 can be very time consuming; however, YouTube and TeacherTube are great resources to use and they contain many songs to fit multiple ages and math needs. By incorporating different songs and dance movements into my lessons, my students have a sense of empowerment over the math that scares them.

There is a feeling of comfort while using examples and notes when solving math problems. When those security blankets are taken away, some are unable to complete the task at hand. They have always had the knowledge to complete the task but we are often spoiled by having notes or examples handy. When you teach a song or dance to teach a math concept, the security blanket never leaves them. I have watched students begin taking a test and start singing (quietly) or dancing in their seat. There is no need to panic while testing because students have empowerment over what they are doing and the numbers on their pages. We want to empower our students to no longer fear math and to have ownership over the numbers on the pages, that is why I feel it is important to give each student another alternative to math education by incorporating song and dance in the classroom.

MathElites
By Cheyne Floyd

When I look at students learning from mistakes, I think of the times that young children touch a hot iron or stove eye. There was a little bit of pain associated with those lessons, but none the less a lesson was learned. The same thing is true when students learn math or any other subject. When students are allowed to learn from their mistakes, there tends to be a deep-rooted pathway entrenched in their brain. Something similar to touching a hot iron or stove eye.

There has been a trend in textbooks to try to identify the possible mistakes that students may make and highlight these mistakes in hopes that the students will not make these mistakes. However, according to their research, Eggleton and Moldovan found that these practices did not prevent the students from making these same mistakes. Their research found that students learned much better when they were allowed to make the mistake and then discuss it in class. The following is a journal entry from one of the students in a classroom that they had observed in:

"Misty wrote the following entry in her journal: Josh couldn't find where he belonged on our class number line. I am not real keen on fractions, percents, and decimals so when I was trying to help him figure out where he was supposed to go, I was having to think to double-time. In thinking so hard about where I thought he belonged, I was learning more about decimals, fractions, and percents. Once we talked about his "mistake" in class, I understood where he was supposed to be and why. So in essence, I learned from Josh's mistake" (Eggleton, Moldovan, 2006). Student learning took place when the student learned from a peer's mistake.

I use this same philosophy classroom. Sometimes the mistakes I make are intentional and sometimes they are not. When I intentionally make a mistake in an equation on the board, I try to make similar mistakes that the students are making. I then have the students explain to me where I made my mistake and then how to correctly solve the equation. When the students do not seem to want to point out the mistake, I will prompt them by asking "are you sure about what I have done", or "look closely." The students then try looking at the problem again.

I have also had the students perform error analysis on their homework if they score below an 80. I borrowed this concept from another school system. When students score below an 80, they must write one to two sentences explaining what they did wrong and then make corrections to the problem. As an incentive, I give the students half credit back for each problem that they write the sentences and make corrections for. This has started to slow some of the students down on their homework.

We all learn from making mistakes, some quicker than others, but we all learn none the less. Learning from our mistakes is a natural phenomenon and should be encouraged in the classroom. The Eggleton and Moldovan noted in their article that father noticed a difference between two of his children. One child learned math the traditional way, not focusing on learning from his mistakes, and the other from exploring through making mistakes. The child that was taught the traditional way gave up when the problems got hard. However, the other child looked at those type of problems and said, "I do not get it *yet*" (Eggleton, Moldovan, 2006). By allowing students to make and learn from their mistakes, we are instilling in them an attitude of perseverance. This attitude will

help them as they encounter different problems throughout life.

Using Food in Math Education
by: Mallory Hoover

Imagine this with me: it's 10 AM during a school day. The day officially starts at 8 AM and your lunch time isn't until 12:30 PM. You ate breakfast at 5:30 AM and your students, if they even ate breakfast, probably ate anywhere between 6:30 and 7:45 AM. What's likely to be on the forefront of everybody's mind? This is no trick question. FOOD. The answer is food. If you're "really lucky," as a teacher you might even hear, "Mr./Mrs. So-and-So, I'm huuuuungry," in the middle of your lessons. As a matter of fact, psychologists at Ohio University actually studied this phenomenon in 2011.

The study surveyed 283 students between the ages of 18 and 25. The participants simply had to record how many times they thought about food over the course of one week. While this may not have been the most flawless way to gather information from the participants, it still presented very interesting results. Their findings showed that women seem to think about food every 62 minutes and men seem to think about food every 38 minutes. That means we as people probably think about food anywhere from about 23 to 50 times a day! Of course the survey only gathered information of a select age range, but I can't imagine it varying much across ages, especially if we take into consideration peoples' accessibility to food, health concerns, and other factors.

So what does this have to do with math education? Well, this actually gives educators a very interesting perspective into incorporating food into their lessons. I believe that there are three very specific benefits to using food in math education. First, food is a manipulative. Second, food is relatable and realistic. Third, food increases motivation to learn and presents itself as both an incentive and a reward. Follow along with me as I dive a little deeper into these three benefits.

First, food is a manipulative. The root word, 'manipulate,' already begins to give us an idea of what that is. To manipulate means to control, take advantage of, influence, or handle. According to ETA hand2mind, a well-known manipulative business in the world of education, "manipulatives are concrete objects that can be viewed and physically handled by students in order to demonstrate or model abstract concepts." In other words, they are tools our students can control and handle in order to aide understanding with something in math they may not understand fully yet. Manipulatives are hands on and promote inquiry in students. I can't think of a better tool students can control and handle with their hands in order to get their minds thinking through something that may be unclear for them than food! Sure, kids are told not to play with their food, but wouldn't the opportunity to play with food make this that much more exciting? You can group food, cut food, symbolize different amounts using different foods, measure food, and so much more! Not to mention, food can be more cost effective than actual math manipulatives. Depending on what you buy, food could be a couple of bucks versus a few hundred dollars for something "official and fancy." I personally love using food in my math instruction. A couple examples of this from my own classroom are buying large bags of discount Halloween candy in order to demonstrate a division task and using a dozen donuts to explore equivalent fractions. We grouped the

candies. We counted the candies. We used the candies to help us identify whether division problems were partitive division or quotative division. We cut the donuts. Then we cut the donuts some more. We analyzed the size of each part of the donuts. We used our understanding of the second cut to then make equivalent fractions with how the size of the donut parts previously looked in the first cut. Food is math.

Second, food is relatable and realistic. As stated a couple of paragraphs above, we as people think about food pretty often. Food is not only a literal staple of life, but our society functions on it too! We meet our friends for food or invite friends over for food. We grocery shop for food. We make stops specifically for food on a trip. We concern ourselves with dieting and the latest health food craze. We share food recipes on our Facebook walls. We post "foodie pics" on Instagram. You get the picture. As a society, we know, need, understand, and love food. Our students aren't any different because, well, they're part of our society too! Kids can relate to food. Food is real for kids. Why look at a context problem about candy for division without candy? Why begin to understand fractions without the context of donuts, brownies, or pizza? It simply doesn't make sense. As soon as food makes an appearance in your lesson, your students can relate to the lesson and they understand that the particular skill you're studying applies to their lives. Why wouldn't we want to make those connections?

Lastly, food increases motivation to learn and presents itself as both an incentive and a reward. If a student can relate to what they're learning, they will be more motivated to learn it. This is both an example of intrinsic and extrinsic motivation. It is intrinsic motivation because they care. It is extrinsic motivation because there is an outside force impacting that motivation. But any way you slice it, motivation is motivation and as educators, we want our students to be motivated to learn! When I presented equivalent fractions to my students without the donuts, most of them probably could've cared less. If I was lucky, my students cared about me, and they cared about their education, therefore they cared about equivalent fractions. But it's not always that easy. As soon as I presented learning about equivalent fractions with donuts, you better believe I had stars popping out of all 21 students eyeballs and excitement rushing through them that couldn't be contained. An added bonus? They performed 100% better on donut-day's exit ticket compared to the donut-less day's exit ticket, and unit test scores were better the first year I used donuts compared to the year before when I didn't use donuts. Whether I'm a student, parent, teacher, or administrator, I'm happy with those results and on board with the learning that's taking place. And the best part (according to the students, of course) of using food in lessons is the fact that you can enjoy it afterwards. Maybe you have students that never get to eat candy. Maybe you have students that have never had brownies. Maybe you have students whose favorite food is pizza. Maybe you have a student that didn't eat breakfast, is out of lunch money in their account, didn't bring money, and can't overdraft, therefore they would otherwise eat no food throughout the day but now get to enjoy whatever food you used in your lesson. No matter what, it's a win when learning can be topped off by eating something. Have students that are typically less than willing to participate in learning activities? I guarantee they will be willing when food is involved, but if not, use it as an incentive! There's no harm in setting

participation goals for your students and making, "you won't get to enjoy the treat afterwards," as the consequence for not meeting the goals.

In closing, food is incredibly beneficial in math education. Our students can play with it, model abstract concepts with it in order to guide understanding, relate to it, and connect skills to the real world. Their motivation will skyrocket and we all are rewarded at the end with a physical reward as well as new learning. If you haven't tried using food in your math instruction, finish reading this, go skim your curriculum, and then rush to a local store to pick up a food to use in an upcoming lesson. I assure you, you won't be disappointed.

2019 NCTM Lifetime Achievement Award Recipients

The Mathematics Education Trust (MET) has selected Johnny Lott, Peg Smith, and Lee Stiff to receive the NCTM Lifetime Achievement Award. The award honors NCTM members who have exhibited a lifetime of achievement in mathematics education at the national level. Johnny Lott, Peg Smith, and Lee Stiff will be recognized during the Opening Session of the 2019 NCTM Annual Meeting and Exposition in San Diego.

2019 NCTM Annual Meeting & Exposition

Join your peers in San Diego this spring to share ideas, news, and innovations. The NCTM Annual Meeting & Exposition will be held at the San Diego Convention Center from April 3–6, 2019.

Follow **#NCTMSD2019** on social media for the latest news and updates.

2019 Regionals

NCTM will be hosting three Regional Conferences in the fall of 2019. Use **#NCTMregionals19** to stay up to date on Regional Conference registration and news.

- Boston – September 25–27
- Nashville – October 2–4
- Salt Lake City – October 16–18

National Math Festival

This spring join the Mathematical Sciences Research Institute and the Institute for Advanced Study for the 2019 National Math Festival.

Hosted by the National Museum of Mathematics, the festival will take place at the Walter E. Washington Convention Center in the heart of Washington, D.C. There will be a School Day Preview on Friday, May 3, before the festival on Saturday, May 4.

To register or volunteer, visit http://dcvolunteers.momath.org/.

The 2019 National Math Festival will have math fun for all ages and resources for both teachers and parents. New this year, the festival will feature an expanded film room, a reading room, and activities that you can make and take home.

Follow @NatMathFestival to stay updated on social media.

Upper East Tennessee Council of Teachers of Mathematics
Membership Application for 2017-2018

Complete and return to Sunshine Light with a check for $10.00 made payable to UETCTM. Completed application and check may be mailed to:

Sunshine Light
c/o Robinson Middle School
1517 Jessee Street
Kingsport TN 37664

Name: _____

Home Address: _____

_____

Home Phone: (_____) _____ - _____

District: _____

School: _____

School Address: _____

_____

School Phone: (_____) _____ - _____

Email Address: _____

UETCTM may be asked to share your information with other math organizations (NCTM, TMTA, etc.) that promote mathematics education.

Please check the following statements if applicable:

☐ I am a current member of NCTM.

☐ Please check if you do NOT want your information to be shared.

☐ I would be interested in leading a session at UETCTM

☐ I would be interested in holding an officer position with UETCTM