DECEMBER 2022 VOL 23 ISSUE 3

UETCTM

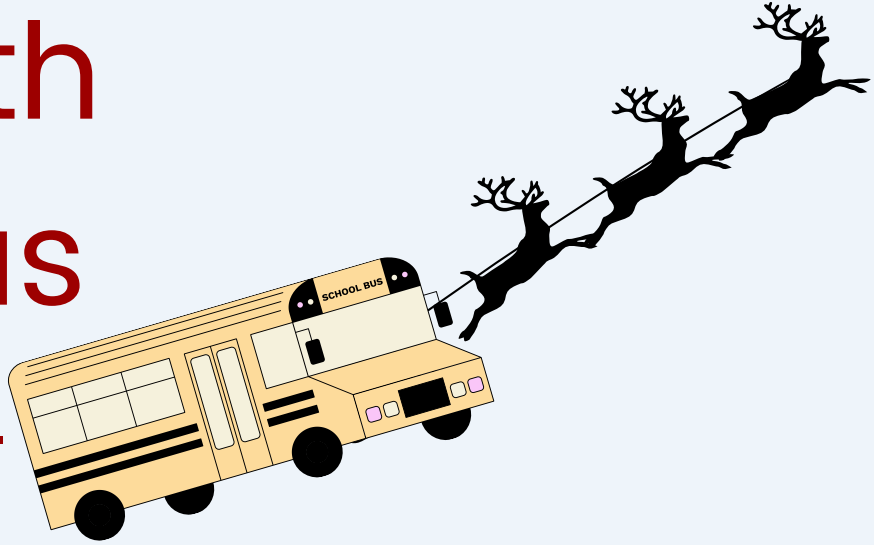
UPPER EAST TENNESSEE COUNCIL OF TEACHERS OF MATHEMATICS

Featuring math teachers from a variety of backgrounds including:

- Kindergarten
- 3rd Grade
- 4th Grade
- 5th Grade
- 6th Grade
- 8th Grade

On The Math Struggle Bus

By Michelle Cradic



I've never really been a "math person." Math was never my favorite subject in school. The truth is, I was on the math struggle bus most of my school career. But fortunately, I had some really great math teachers along the way who were patient and did not let me fail.

In years past, if you asked me if I wanted to help with Family Literacy Night or Math Night at school, I almost always chose literacy. I knew I needed to implement some new and interesting ways to teach my Kindergarten students the basic concepts of math, and new ways for them to practice each day. My students deserve to be challenged. That is why when I was given the chance to improve my craft, I jumped at the opportunity to attend MathElites.

Of course, I was pretty nervous attending a class with many educators from around the Tri-Cities. I knew for sure that I would be out of my element. I was fearful that I would be intimidated by all of the brilliant math minds around me. When we started the class with a "pre-test" I knew I was in over my head. I had no clue what a 3-Act Math Task lesson consisted of in the math world. I was only functioning from my limited knowledge, and a head full of self-doubt.

My K-2 professor, Jamie Price, did an excellent job of presenting the material and gave lots of support along the way. We had a presenter from Code.org who talked about coding in the classroom. I had no idea what coding consisted of in the world of education. I knew I had a children's picture book, *How to Code a Rollercoaster*, in my classroom, but had never read it to my students. I figured since I didn't know much about the subject, I really couldn't elaborate or explain anything to my students. But, now that an expert came to my MathElites class and taught me about coding, I knew I had to read that book! We practiced coding Beebots and I became more familiar with coding strategies and resources. I was also making some new friends along the way!

On another day, we began working in collaborative groups to create a lesson that would help students gain knowledge across grade levels. We practiced researching and using 3-Act Math Tasks to instruct our students. The professors gave advice and support along the way. I am excited to use these resources in my classroom routinely.

After being surrounded by some really good mathematicians and having the opportunity to learn some new techniques and strategies to challenge myself and my students, I feel more confident that I can help my students strengthen their own math skills in the coming years.

I am so grateful to have attended MathElites, and to have finally exited the math struggle bus with some teaching tools and a little bit more confidence!

2023 SPECIAL ISSUE CALL FOR MANUSCRIPTS:

SUBMISSION DEADLINE: February 1, 2023 **PUBLICATION DATE:** October 2023

Here, we share the blueprint for the 2023 *MTLT* Special Issue. Students of all ages benefit from building — from stacking cubes and designing bridges to exploring geometric constructions. *Build It!* activities have an important mathematical goal and an openness that engages students in creating their own representations, visualizations, or explanations. When students have opportunities to create representations or prove something is true, they develop agency ("I can figure this out!") and that contributes to a positive mathematics identity ("I can do math!"). Building begins with teachers designing and adapting tasks that provide an opportunity for students to build.

We are seeking your best *Build It!* tasks in order to 'construct' a unique Special Issue — one that is full of engaging tasks that invite students to create, reason, discuss, and connect with the mathematical ideas they are learning. Manuscripts will be brief (limit 1,500 words, including references) and provide insights to see the thinking behind the task, as well as the impact of the task. Key elements of a manuscript may include: sharing the task (key features), how you have implemented the task (guidance on introducing and question posing), and/or illustrations of how students have engaged with the task (student work, pictures, dialogue).

IDEAS TO CONSIDER IN PREPARING YOUR MANUSCRIPT

CONSTRUCT IT!
Students building representations, visualizations, and situations

- What activities prompt students to show why or how something works?
- What favorite task(s) use a physical or virtual tool(s) to make sense of mathematics?
- What task invites students to create a visual or story that supports their mathematical learning?
- What activity engages students in choosing and using multiple representations and pathways?

IMPROVE IT!
Students building in opportunities to critique, revise, and expand ideas

- What strategies do you use to engage students in cycles of revision?
- What classroom experiences promote rethinking and perseverance?
- What learning activities promote an iterative approach to learning concepts?

MODEL IT!
Students building mathematical models

- What is a favorite task that involves students in mathematical modeling?
- What mathematical task connects to students' career or hobby interests?
- How have you adapted word problems to become a mathematical modeling experience?
- What technology-enriched tasks have you used in which the technology has enhanced student engagement with mathematical modeling?

2023 SPECIAL ISSUE CALL FOR MANUSCRIPTS:

PROVE IT!

Students building ways to show how they know

- What is a favorite task that involves students in proving a concept, property, or statement is true?
- What task(s) have you used to promote learning mathematics through proof?
- What ways might students show or prove something is true?

IMAGINE IT!

Students building and connecting among concrete visualizations and abstract ideas

- What is a favorite task that encourages imaginative thinking or creation of mental images?
- What activity employs computational thinking (pattern recognition, algorithmic design, abstraction, and decomposition) to support students creating innovative designs using mathematical thinking?
- What task(s) help your students imagine, think outside the box, or go beyond the status quo (i.e., stretch boundaries)?

We hope one or more of these prompts has reminded you of a great task you have implemented! But you may also have built something that effectively addresses a different element of mathematics teaching. Please consider sharing what your students have built and what you have built by submitting a manuscript for this *Build It!* Special Issue.

AND, PREPARING *BUILD IT!* OPPORTUNITIES FOR STUDENTS

DESIGN IT!

Teachers preparing tasks and assessments

- What lesson structure/design encouraged imaginative and creative thinking?
- What is an innovative instructional strategy that transformed your mathematics classroom environment into one that fosters students' designing solution strategies and solving problems in innovative ways?
- What tools or plans have you created/used to assess students' creations (i.e., representations and explanations) and/or advance their thinking?

ADAPT IT!

Teachers building onto or changing tasks to connect to each and every student

- What activity/ies, task(s) or tool(s) have you modified to make it more accessible for a particular population of students?
- How have you enhanced a task to make it more relevant to your students?
- What 'blueprint' task-design ideas increase access to mathematical content? To support positive mathematical identities?

Please submit manuscripts through ScholarOne (**https://mc04.manuscriptcentral.com/mtltpk12**), selecting "Special Issue: Build It!" as your manuscript type. See Submission Guidelines (**www.nctm.org/mtltsubmit**) for more information on article types. Word limits apply.

Questions?
Contact **mtlt@nctm.org**.

Portfolio: A Complete Measurement

By Heather Jones

How is student content knowledge measured? Today content knowledge in the upper grades is measured with standardized testing, universal screeners, checklists, anecdotal notes, and portfolio. Standardized testing alone is insufficient to show the depth of student understanding over a subject matter. Standardized testing and universal screeners are beneficial for measuring student data based on one standard. However, they do not show everything about a student's knowledge. Checklists and anecdotal notes also provide a quick check on student understanding.

Unfortunately, these types of assessments do not always show the full spectrum of student understanding or their full knowledge on the specific subject matter. Portfolio Assessments, on the other hand, are beneficial for all stakeholders in education and are flexible enough to demonstrate metacognition, different learning styles, and important data.

Specifically, portfolio assessments are one of the most important assessment tools as it allows students to demonstrate a plethora of

knowledge on a subject matter. The tasks provide insight into students thinking about the "why" behind a solution. Portfolios are a way to show student personality as well as their method of thinking. Math is memorizing the algorithm and mimicking in order to solve a problem. One equation is solved one way for one answer. However, as we take a step back and allow for students, of any age, to wrestle with a problem we find the aforementioned statement to be false. The portfolio method of assessing students allows us to see this in the video artifacts.

In the process of a portfolio assessment, the teacher will ask all students to complete one universal task or solve an equation. The teacher will observe as the student wrestles with the task of solving the problem. The task does not change from point A to point B unless the student is able to complete the task without struggle. In my personal portfolio artifacts from this past school year, I provided varied manipulatives for students to work with and show their mastery. The manipulatives allowed students to showcase their thinking and demonstrate mastery.

Misconceptions about student thinking are also cleared up just by observation. This past year, I had one student who was asked to decompose the number seventeen into tens and ones. She grabbed the straws and counted out seventeen single straws. I originally thought that she did not understand what the task was that I had asked of her. Therefore, I repeated the instructions and she looked at me and said, "I know, silly. I am not done yet." I let her

continue and watched. She had counted out the seventeen individual straws, but then she laid them out and gathered ten of the seventeen. The student bundled the group of ten with a rubber band and laid it next to the remaining seven. She then said, “all done. I have seventeen. One ten and seven more, Ms. Jones.” I was impressed.

Furthermore, as this student’s teacher, I found that her understanding of this skill is considered mastery. The portfolio assessment task led me to see how this student thinks about the idea of teen numbers compared to her peer who just grabbed a base ten stick and seven individual blocks for their answer. The task of gathering and collecting a portfolio also helps in that it is easy to tell when a student is simply guessing versus solving the problem.

Moreover, portfolios are beneficial in that the tasks are not “scary” because students do not view it as a test. Students are eager for the fun and challenging portfolio tasks that are presented to them. It takes subjects like math and lets them wrestle with their thinking in that judgment free environment. In my personal experience, students are begging to go first or next with the math task. Students demonstrate extraordinary growth using the portfolio method. Evaluators can clearly see students’ learning long term. Students are also able to track their own learning. Students’ desire to learn only increases when we give them the opportunity.

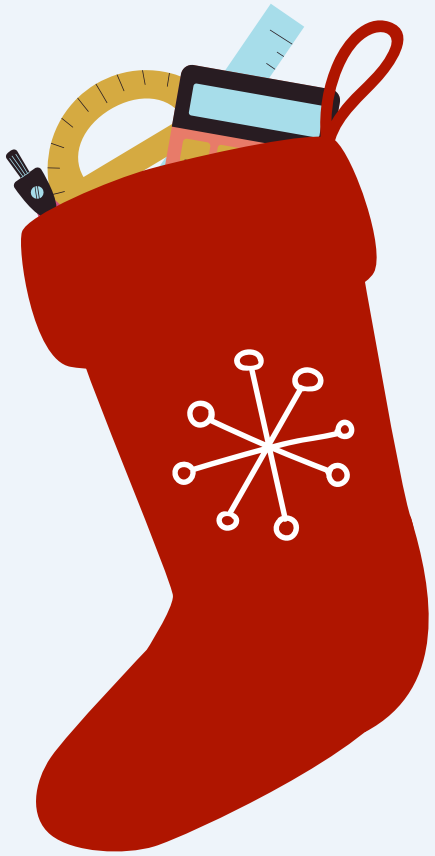
Personally, I have a deep appreciation for the process. It shows the growth my students make and allows students to see their growth as well. Students love the idea of show

and tell. So why not let them do this with portfolios? Students in multiple grade levels and other content areas would benefit from portfolio assessments. One way to assess students should not be the only way to assess. Balance is key in understanding a student's level of understanding. Standardized tests alone are not enough. Writing an essay one time is not enough. Anecdotal notes and checklists are not enough. Portfolios alone are not enough.

In short, the idea of the portfolio assessment is considered by some teachers to be overwhelming, cumbersome, or even useless. Why would we tackle this giant task versus giving out a multiple choice test? Portfolios give back success to our students, increase levels of effectiveness, and allow thinking to return to the classroom. Teachers require time to video students solving summative tasks over the course of the school year. However, once you start the process and gain practice, it only gets easier. I respectfully disagree with colleagues who say portfolios are useless because I have seen how powerful they can be for students. Our educational society will only benefit from allowing students to wrestle with their thinking in this risk freeway. In the best interest of students, I hope this process will be extended into other grades and subject areas. The idea of letting students think and reflect on their own learning will continue to be an educational best practice.

Dilations: A Step-by-Step Process or a Process of Self-Discovery?

By Michelle Walters



Math— is it teaching a solution or a process? Who leads the process? Is the process guided by the teacher or the student? These ideas and concepts are all major themes that I have often pondered. Recently, the importance of the answers to my ponderings has challenged me to be really intentional in lesson planning. One such math activity follows. Students are plagued with understanding dilations. The fortunate ones that "get" the correct answer, usually do so due to mimicking the process. Then, the correct solution becomes a barrier to understanding what a dilation actually means when transforming a figure. The typical steps involved in dilating a figure is first, measuring the side lengths. After the measurements are taken, you take the dilating scale factor and multiply each of those measurements to find the new dilated measurement. Depending on the scale factor, the new figure is enlarged or reduced. But, in the end, do the students truly understand? Do they have a full appreciation of the fact that to keep the figure similar, that the angle measures must stay the same?

We often “teach” dilations on the coordinate plane to make sure the “process of dilating” a figure is followed. On the coordinate plane, we first identify the ordered pairs of the vertices of the original figure that we are dilating. This identification is to find those side length measurements, but students soon learn that if they just take those ordered pairs and multiply that by the scale factor, they can correctly find the “new” ordered pair. Next, they plot the new vertices and find the correct solution. This process stifles learning. Students are more concerned with getting the answer correct than understanding the math. This is most often death to their future learning. Some of the important math concepts that should have been learned will be lost. So, when confronted with new learning where these concepts should be applied, the students do not have the necessary tools to master the new learning. This is why intentional lesson planning is so important.

In the following activity, students are guided through the process of taking measurements, and applying previously learned skills, to discover dilations and the important concepts associated with dilations, such as side measures change in proportion to the scale factor while angle measures stay the same.

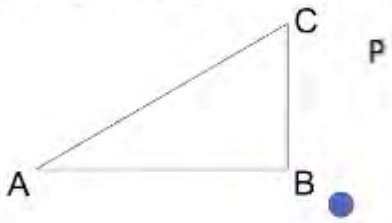
When learning is open ended, curiosity is sparked and students ask questions. This leads to investigations that may generate connections that have never been noticed. These kinds of activities may just lead young minds to places never gone before.

(Dilation of a Triangle Activity Sheet featured on next page)

Dilation of a Triangle Activity Sheet

(Students can complete this activity on a blank sheet of paper. For a more guided approach, students may use graph paper.)

Step 1: Choose a polygon and a point outside of the original shape



Step 2: Connect Point P to each vertex of the Triangle

Step 3: Measure each line that was created

Step 4: Increase/decrease the length of each connecting line in the same proportion (This proportion often is given as the scale factor. You can have students decide their own or you give the scale factor. Allow students to try several different ones. Examples can be 2, ½, 3, etc….)

Step 5: Join the new points to create the new image

Students will need to record their data, observations, and wonderings. This can be as easy as notes or they can create tables like the following:

Segment Measure	
AB=	A'B'=
BC=	B'C'=
AC=	A'C=
Angle Measure	
A=	A'=
B=	B'=
C=	C'=

Questions:

1. What do you notice about the lengths of the sides of the triangle?
2. What do you notice about the angle measures of the triangle?
3. What is the relationship between the 2 triangles?
4. What other measurements could you change and how would that affect the transformation?

NCTM NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Affiliate News

INSPIRING TEACHERS. ENGAGING STUDENTS. BUILDING THE FUTURE.

Your MARC Representative

On October 1st, membership on the Membership and Affiliate Relations Committee (MARC) transitioned. Along with welcoming new members, some adjustments were made to the size of the committee. I want to thank all of our outgoing members for their service. Their commitment to our affiliates was key as we navigated the past few years. Our new committee will be meeting, IN PERSON, within the next few months to plan and prepare to serve you. Check out the Affiliates section of www.nctm.org to find resources to support your needs. Please be assured that your MARC Representative is here for you.

The name and contact information for your MARC Representative is:

Bernard Frost
Moore, South Carolina
Email: befrost@spart7.org

As always, if you have questions or need assistance, please reach out to your MARC Representative, or to affiliates@nctm.org

Take Care,
Marci Ostmeyer
NCTM MARC Chair 2022-2023

Gardening In The Classroom

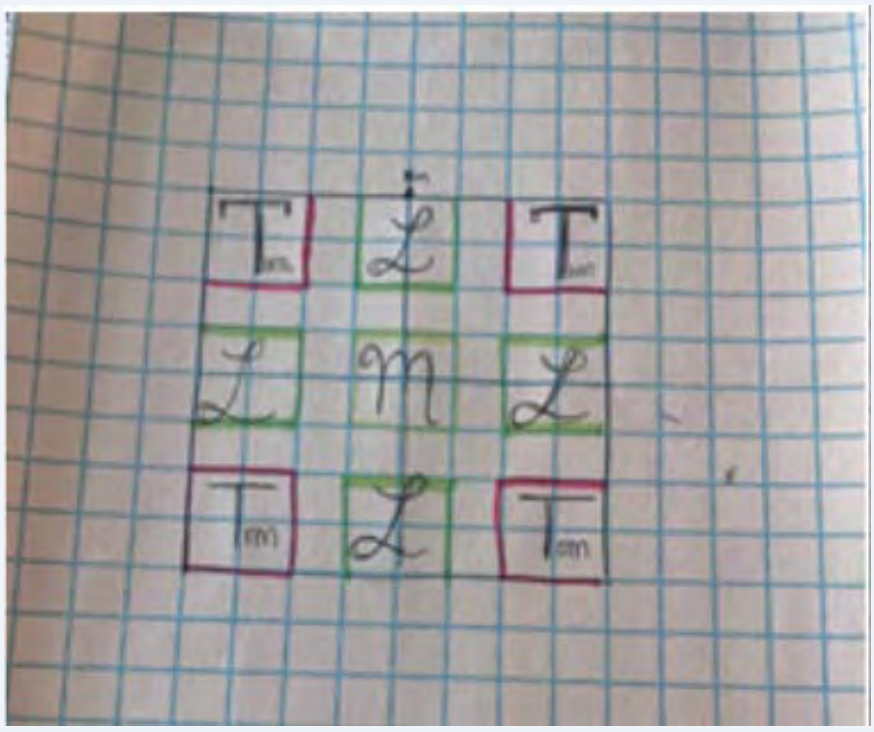
By Kristine Barrett

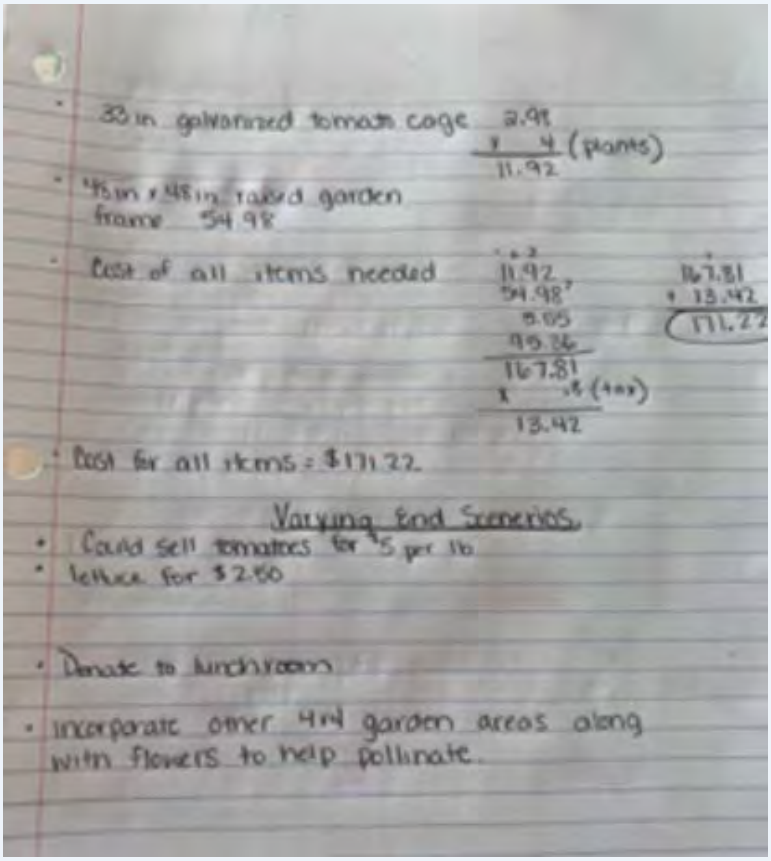
Students need more real-life experiences in the classroom. They need to see how things outside the classroom relate to what they are learning. Each spring, I plant seeds for my summer garden and harvest throughout the summer and fall. Having students engage in this activity will be beneficial for their learning and schema. Students will be able to use this gardening experience to find measurements, volume, unit rates, money conversion, etc. Students will also use communication skills to peers, teachers, parents, and the local community.

Topic	Idea
Design constraints on solutions	Students will need to construct a specific area and location of the garden, containers, and plant size. They will need to use specific dimensions as well as knowing what volume types of containers have.
Concept of ratios and unit rates. Using ratio and rates to solve real-world and mathematical problems.	Students can find the unit rate for items. The "better buy" of two of the same item, but different quantities. For example: Is the 40qt bag of potting soil a better buy than the 32 qt?
Expressions and Equations	Students will be able to evaluate expressions using formulas involving prices and quantity to purchase items for the garden. Students may also use variables to represent the cost of items and multiply by the quantity needed.
Geometry	Students may practice drawing garden structures on a coordinate plane with specific dimensions and perimeters for plants.
	Finding the area and volume of different containers for gardening.

Anticipated Student Work

Example garden layout with specific perimeters. Tomatoes cannot be placed directly next to each other.





Decimals, Decimals, Everywhere

By Rachel Kilgore

Decimals, Decimals, Everywhere
When I look, all I can see
Are decimals used for you and me
They're way up high in skies and planes
And way down low in roadway lanes
Sometimes they appear in money we spend
Even in prices that often ascend
How about cooking, when in need of a snack
Or checking the time, when running in track
Decimals, Decimals, Everywhere
We use them for measuring things big and small
And they help us spend money when shopping the mall
They seem really small, but have such an impact
Especially in sports when there's not much time to react
I always wonder who made them, was it you or was it me
I'm not quite sure, but they seem somewhat friendly
Decimals, Decimals, Everywhere
Students aren't sure of them when seen in problems
Little do they know they just have special columns
Decimals are often something we devalue
If only we'll take time to look at their place value
Why are they always something we shove
If we'll give them a chance they can be something to love
Decimals, Decimals, Everywhere

Will Your Egg Survive?

By Meredith Ashton

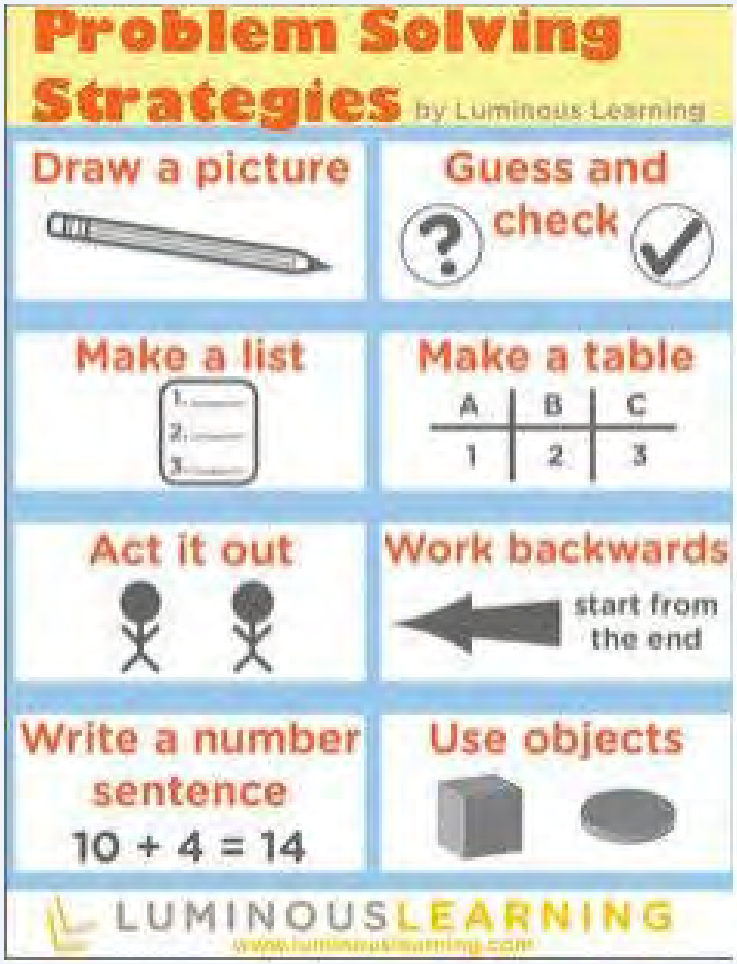
Throughout my five years of teaching, I have come to the conclusion that our students need a deeper understanding of mathematical problem solving skills. While a part of the MathElites program, I was able to make the connection that mathematics is not about memorization, but rather is based upon reasoning. I have learned that these problem solving skills are not always learned at home and need to be incorporated as much as possible. The benefits of incorporating problem solving in our daily math lessons, allows students to solve hypothetical and real word problems in other subjects.

Our fourth grades at Jonesborough Elementary are faced with a real word problem every year. Will your egg survive? Students are to use their problem solving skills that they were immersed in while in math class, and develop and design a system to protect a raw egg from cracking or breaking from a high fall. The only thing is, not only will it fall from the roof of the school, their principal never plays fair. He likes to bring items that will put their system through the ultimate test. He is known to use a baseball bat, rocks, bricks and logs to push the system to its full capacity

Students start by creating an illustration of their system and writing about the specific materials that they will use. They then have the opportunity to discuss with their classmates about what materials they think will be best to put their egg to the ultimate test. Students are able to use their act it out

problem solving strategy, and can practice putting their raw egg to the test at home. Once students are able to test their system, it is time to determine if their hypothesis is correct! All of their systems are placed on the roof of the school and one by one are slammed with bats, rocks or bricks! Students are then able to check if their raw egg survived the fall. You would not believe how protective peanut butter is!

Developing problem solving skills in our elementary school students encourages them to believe in their ability to think and solve mathematical problems. Ultimately, students will see that they can apply the math strategies they have learned or are currently learning to find the solution to a real world problem. Not only will students be able to design and build a structure for a raw egg to survive an unnerving fall, they will be able to grow individually and have the confidence to take calculated risks.



Is My Bellringer Worth the Time?

By Danielle Mitchell

As a self-contained teacher, I have always begun each morning with some type of morning work that incorporates math and ELA standards. This gives the class time to settle in and accomplish all those morning "housekeeping" tasks. With the possibility of transitioning to a departmentalized environment where I will focus on one academic area with different groups of students transitioning in and out on a very set schedule, I find myself examining my morning work routine in the light of this change and asking myself, is this worth the time I'm giving it? What can I do to prioritize my time and make every minute count with high quality instruction?

After doing some research on the effective use of a 90-minute block, my conclusion is the use of that precious time is all about priorities. What is most important in educating my students in the time given? In examining my students problem solving abilities, digging into my curriculum's real-world connections, and knowing it must be a priority to increase the quality of both of those, I am finding that my traditional spiral review morning work/bellringer is not worth the time I would need to devote to it in a departmentalized 90-minute setting. (And in reflection, was is ever worth its time in any setting? Live and learn, I guess.) Yet, I am unwilling to totally give up the idea of a bellringer activity of some kind. The next step is to decide what to do about it.

In This Issue

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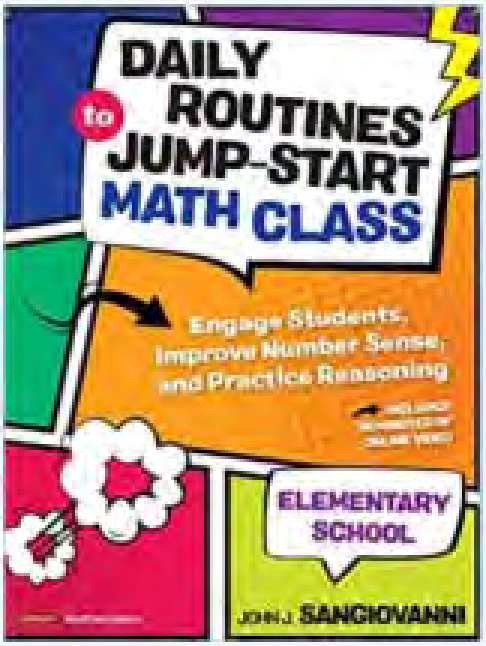
During professional development opportunities this summer, I have gained exposure to so many more ideas that I am hopeful will accomplish the priorities of real world connections, problem solving flexibility, and increasing number sense through a variety of bellringer activities. What follows here are my ideas about making my priorities match my teaching and therefore, student learning through a variety of games and tasks.

1. <u>"Jump Start" Routines</u> choose one or many to use on different days (the first and best...so many super cool ideas).

2. <u>Stump the Teacher</u> (a version I stole from another teacher and tweaked to fit my style): The goal is to create as many representations of the number as possible in a given time. For example, if 42 were the number of the day, students can represent it as 4 tens and 2 ones, 7 × 6, perimeter of a rectangle that is 11 by 10, tally marks, addition or subtraction equations, etc. The teacher will

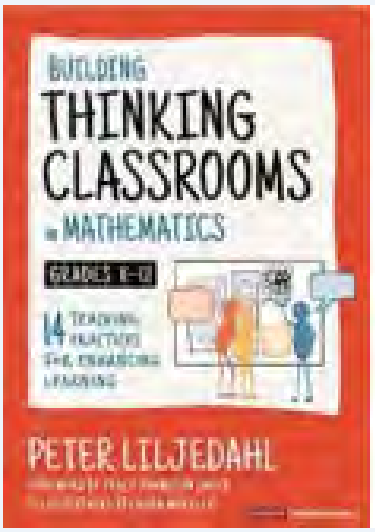


Many of the routines in this book are Kagan-esque but not all of them. There are 20 routines described and ready-to-use examples are given. With a game-like quality, students are engaged in quality conversation and work related to standards and curriculum. I have personally participated in the "Math Yapper" routine and thoroughly enjoyed it. You can also find additional examples online at <u>https://resources.corwin.com/jumpstartroutines/elementary</u> But those resources are a companion to the book. Owning the book will give you access to the examples on the web.

participate as well, but those ideas can be generated and recorded ahead of time. At the end of the given time, students can share their ideas and see if they can "clear the teacher's board." Did someone in class have the same ideas as the teacher? What ideas can be added to the teacher's board?

3. Problem of the Day (highly engaging multi-step "word problems" with a real world connection): There are many written problems in my adopted textbook that I don't always get to or that I would like to tweak to make more relevant to my students. Choosing one of those or finding another written task that students could perceive as a riddle would allow students to develop persistence in problem solving in an engaging way. A couple of resources, outside of the adopted textbook that could be helpful are pictured here and I recommend them both.

4. 3-Act Tasks (completing all 3 parts is more than a bellringer, but it could be broken apart across days): These 3-part tasks have students 1. Notice and wonder, 2. Answer a simply worded question, 3. Share and have the answers revealed. While the first two steps can be easily transitioned into a bellringer time limit, the last step may take more time. If they don't fit the idea of bellringer, 3-act tasks are definitely something to keep in your back pocket for those lame duck school days or short days.



Book contains the product of work to challenge classroom "norms" looking for more productive ways to impact student learning. It has examples within each norm.

Picking a type of bellringer for each day and to implement while gradually introducing others will show the students right away that this is a classroom that requires thinking and primes them for engagement throughout the 90-precious minutes that I have. Using the standards and lesson content, I can choose something that leads into the content of the lesson. The priority is to get them thinking and engaged early in the block. According to the work done by John J. Sangiovanni in *Daily Routines to Jump-Start Math Class*, routines like those in his book "are designed to develop students' reasoning and/or sense-making. They aim at improving students' number sense. They are a makeover for the beginning...so that students have access to meaningful, engaging, quality practice." That's my goal...making my use of time align with the priorities.

So what will happen to my previous spiral-review morning work/bellringer? That is yet to be determined. Maybe selected items on an exit ticket, maybe it will go into a small group station where students can practice and help each other review, or maybe it won't find a place in those precious 90-minutes.

https://gfletchy.com/
Lists many 3-act tasks arranged by grade level. Videos are already made and recording sheets too. There is also a list of places to find more tasks.

https://illustrativemathematics.org/
Has groups of ready-to-go tasks sorted by grade and domain.

Upper East Tennessee Council of Teachers of Mathematics

Complete the application and return to the address below with a check for $10.00 made payable to UETCTM.

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