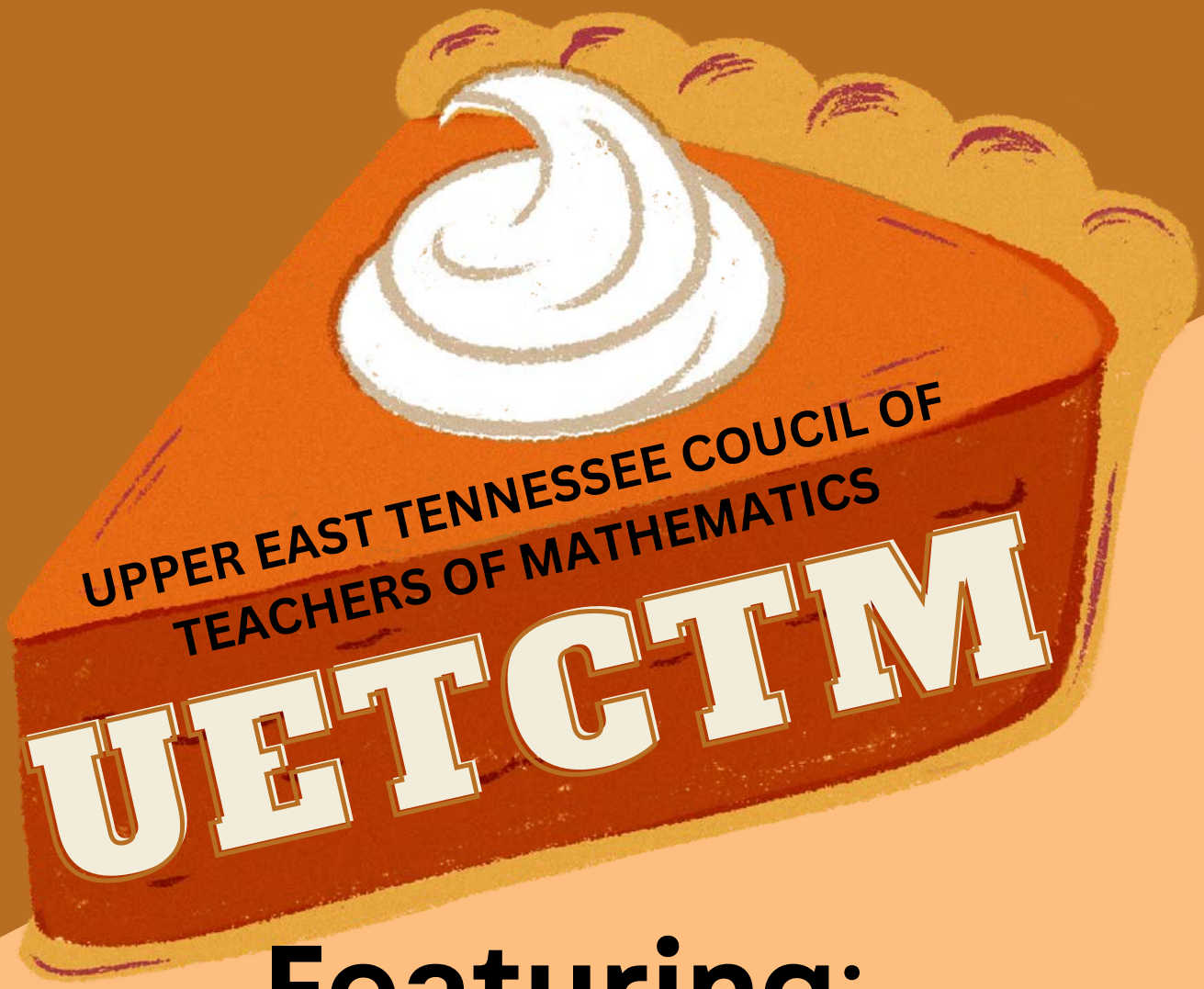
November 2022 Vol. 23 Issue 2



UPPER EAST TENNESSEE COUCIL OF TEACHERS OF MATHEMATICS

UETCTM

Featuring:

Virginia Marshall, 6th grade

Jessica Drinnon, Kindergarten

Ryan Dent, 10th Grade

Andrea Anderson, 2nd Grade

Heather Gregg, 3rd Grade

James "Tyler" Hensley, 5th Grade

IN THIS ISSUE

Struggling to Make Connections? Make Lemonade!

By Virginia Marshal

As a middle/high school student, thinking mathematically did not flow easily from my brain. It was, on a good day, a real challenge for me. I did enough to earn a "B". It seemed irrelevant to my life. I didn't see the connection between me and what my teachers were trying to teach. And I had fantastic teachers. They were all wonderful and eagerly helped me. Yet I just copied the problems off the board because my teacher told me to, I said a prayer, and didn't look back. (We all know that student, right?) How funny is it that now, 17 years later, I've decided to earn my middle and high school math endorsement?!? Here I am, finishing up preparations for the NES exam.

That's why I chose to participate in MathElites over the summer; to help me prepare for the test, and for the year ahead. I am so thankful for the decision I made. I felt I was going in underprepared, and inevitably felt intimidated on Day #1. I imagine this is exactly how some of our students feel on their Day #1. Underprepared. Invisible. But, thanks to Dr. Nivens and my fellow cohort of teachers, I've rediscovered the value in productive struggle. I was challenged. Stumped. Inspired. Supported. I was able to see the connection to what I was learning to real life. We used

real-life examples, even going outside and measuring the height of the ETSU Kingsport campus building by bricks!

My hope for my students is that I can be their Dr. Nivens or Dr. Price. I want to be able to inspire and encourage, push and challenge them, just as I have been. Making those connections to motivate students is critical. It has been a true gift they've given me, intentional or not.

Dr. Jamie Price introduced our group to 3-Act tasks. This strategy was all new to me, however, I found it to be similar to using phenomena in science to get kids excited about upcoming content. Dangle that carrot.

3-Act tasks are divided into 3 parts; Act 1, Act 2, and Act 3. Many teachers add a Sequel, or Act 4, as an extension activity. In Act 1, students are introduced to a real-world, engaging problem to solve. It is typically an engaging video clip, picture, or activity that is thought-provoking and leaves them stumped and wanting more. There's a small discussion about what students notice and wonder before moving onto the next act. Act 2 is all about finding out the information needed to solve the problem. Act 2 is the "meat" in my opinion. This is where the real critical thinking occurs. Trying to decipher what is needed and what isn't is a critical skill practiced in Act 2. Act 3 is generally the "big reveal". This is where students share their thinking and compare ideas. I feel that these types of teaching strategies are worth their weight in gold. This idea lends itself to such rich discussion and mindset shifts.

While I did not create a task myself, I did find one of particular interest to you fifth and sixth grade math teachers out there. Dr. Price introduced me to Dan Meyer. I encourage you to watch his 2010 TED Talk, where he discusses creating problems that cause students to pause and think; to become "patient problem solvers", as he calls it. He also has a blog where he has compiled many 3-Act tasks that teachers can use in their classroom. They're already made and ready to go. This is where I found Nana's Lemonade.

In the state of Tennessee under Standards 5.NF.B.6 and 5.NF.B.7, 5th grade students work extensively with multiplication and division, and this work leads them to:

- divide unit fractions by whole numbers and whole numbers by unit fractions
- multiplication of fractions and mixed numbers by using visual fraction models

In sixth grade, this standard expands to:

- Interpret and compute quotients of fractions, and solve contextual problems involving division of fractions by fractions

Dan Meyer's "Nana's Lemonade" starts with a question and a short video of 2 cups of water. See the sequence below.

Task

- Using a deck of cards, randomly group students into 3's.
- Follow steps below for Nana's Lemonade 3-Act Task.

Act 1

- Show video
- How many lemon wedges should we use to make it taste the same?
  - What's your guess?
  - What's an answer you know is too high? Too low?
- What do you notice? What do you wonder? Write answers on VNPS's in groups.

Act 2

- What information would be useful to know here?
- Guess the volume of the smaller cup. Write estimation on VNPS.
  - Show Image #1
- Guess the volume of the larger cup. Write estimation on VNPS.
  - Show Image #2

Act 3 - the big reveal

- Encourage students to come up with 2-3 strategies.
- Show video
- Discuss and show solutions on VNPS within groups.

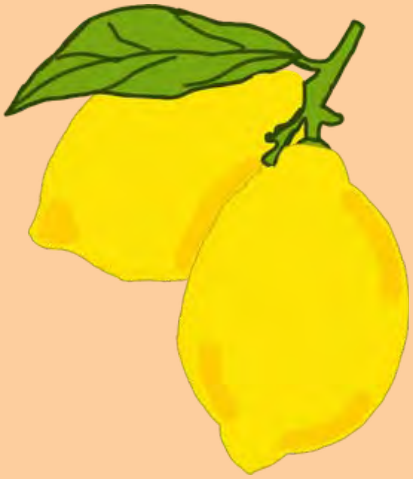
Sequel

- What fraction of the big gulp is lemon juice
- How many lemons would I need to make a gallon of lemon water?

Closer Activity - Make lemonade! Below is the recipe for a single cup of lemonade. Working in groups, students should calculate the ingredients and amounts they will need for 20 cups of lemonade for the entire class (or however many students you have on your roster).

Single Cup of Lemonade Recipe

- 2 Tablespoons granulated sugar
- 1/4 cup hot water
- 3 tablespoons fresh-squeezed lemon juice I used about 1 ½ small organic lemons
- 3/4 cup cold water
- Ice
- Lemon slices (optional)



Instructions

1. In a 2 or 4 cup measuring cup, stir together the sugar and hot water until the sugar is dissolved. Stir in the lemon juice and cold water.

2. Fill a large glass or pint mason jar with ice and several lemon slices. Fill to the top with lemonade and enjoy!

How much of the following are needed for a class size of _____ students? Work together to determine the amounts needed for a class of ____ students.

	Needed for a single serving	Needed for ____ Servings
Granulated Sugar	**2 tbsp**	**?**
Hot water	**¼ cup**	?
Fresh-squeezed lemon juice	**3 tbsp**	?
Cold water	**¾ cup**	?

We use math on a daily basis, multiple times a day. We use math to measure ingredients for cupcakes, calculating how much our gas is going to cost as we pump it into our tanks, and what the tax will be on our back-to-school clothes. We teachers use math in simple tasks like dividing up groups for projects, finding our class averages, and marking papers for grades. My kids use math when they measure the lengths, widths, and heights of their cardboard fairy houses and also when they build race car tracks through the house. It's all about building that connection to make it relevant and interesting.

NCTM Professional Development

Plan to Attend the Preconference Workshop in Baltimore

Are you planning to attend the 2022 Baltimore Regional Conference & Exposition? If so, you can get a head start on professional development when you register for the preconference workshop--Multi-Tiered Systems of Support: What are Effective, Research-informed Interventions and Strategies?

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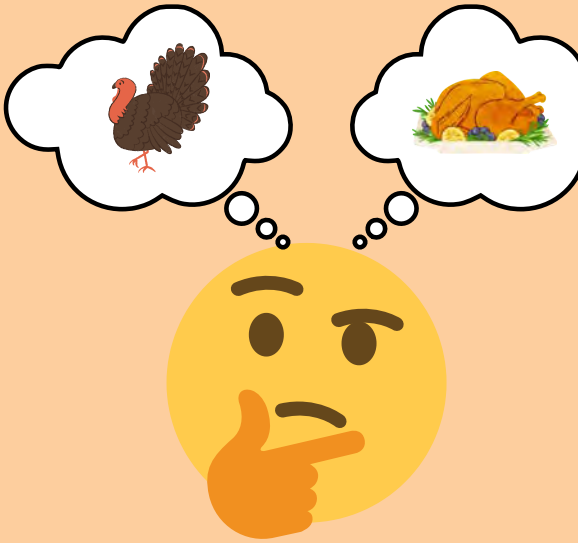
Concrete, Representational, and Abstract: Which Way of Thinking is Best?



By: Jessica Drinnon

As a kindergarten teacher, I often use manipulatives to make abstract ideas more concrete for my students. Some would ask why, and I would challenge them to say, “why not?” Many times, I introduce concepts to my students, and to many of them, it seems like a foreign concept. Using manipulatives to make those concepts more hands-on helps develop their understanding and starts creating connections that they can build from. While the goal would be for students to be able to think abstractly, we can’t just start there. We must teach in ways that bridge the gap from concrete thinking to abstract thinking. We must model concepts and bring them off the page so that students can interact with the work being done. Sometimes students just need to see it and manipulate it to fully understand it.

If someone were to ask you when a student should stop using manipulatives and move to strictly abstract thinking, what would you say? Would it be third grade? Maybe eighth? What would your reaction be if a high school algebra teacher broke out manipulatives for their students to use? We are always told about the importance of using manipulatives in a primary classroom. Many teachers that I have spoken with say they envision manipulatives to be used in grades K-2, but should it stop after second grade? I would say the answer is no.

My daughter just completed fourth grade. She isn’t an

abstract thinker. She can memorize multiplication and division facts like a champ, but when it comes to applying strategies and seeing why things work, she struggles. I've often tried to explain my abstract thinking to her, and she looks at me like I've just spoken another language that she can't comprehend. Now I could say that it is that way simply because it is hard teaching your child, but the reality of it is, that she isn't ready to think abstractly. If I use manipulatives to bring that concept to life or even draw a picture to model the problem, it becomes less frustrating to her. She starts to process the concept and begins to strengthen her understanding simply because the concept was brought to life instead of just listed on the paper.

I recently sat through a Math Elites lesson where the instructor had us work through a task using ORPDA. If you haven't heard of it, it is a way of counting that isn't represented by numerals. Instead, quantities are represented by symbols. To make it more challenging, the task-focused on a base five system instead of the base ten system we are used to. As the tasks were presented, I started feeling frustrated. I was reading words like carety-caret and atty pound and was trying to figure out what that looked like as it related to the numbers I would think of as 44 or 23. Once the instructor brought out blocks and modeled what carety-caret blocks looked like, I began to understand. Without the manipulatives representing the phrase, I was frustrated. With the manipulatives, I could see what it looked like. I was a thirty-five-year-old student feeling the same frustrations my kindergarteners feel when I ask them to show me what eight looks like while not understanding successive numbers, quantities, and counting. That was the whole

point of the lesson. As a teacher, I needed to take a step back and feel as frustrated as my students do to understand where I need to meet them.

I've said all that to say this, there is no stage of thinking that should be withheld from our students. There isn't an age limit for using manipulatives or creating drawings to understand a concept. To be an effective math teacher, we need to give students opportunities to think, feel, and engage with the concepts. If you have an eighth-grade student who doesn't process what you mean when you ask the value of a number to the third power, let them draw it out. If you have a fourth-grade student who can't see what a structure would look like with a perimeter of 37, give them some geometric tiles and let them make that structure come to life. It is a common misconception that manipulatives belong in the primary grades. What isn't a misconception, is that as a teacher, we need to help students build bridges from the concrete level of learning to the representational and abstract levels of learning. Even more importantly, we need to show our students that it is okay to cross back over from abstract to concrete sometimes to help them develop a more thorough understanding of a demanding concept. There is no shame in that. Instead, allowing students to navigate through the different stages of thinking helps them become more fluent mathematicians. As educators, let's work to make our students confident in crossing the bridges to understanding. Let's meet them where they are in their understanding and help them create bridges to be able to think at all different levels. If we do that, we can set our students up to be successful in any scenario presented to them. Isn't that what we want as teachers? We want our students to succeed. Let's help them do so! 

Proposals for the 2023 Annual Meeting are Due October 7
If you haven't already, be sure to submit a proposal for the 2023 Annual Meeting & Exposition in Washington, October 25-28.

Presenters include classroom teachers, math coaches, administrators, math teacher educators, teachers-in-training, and math specialists.

View Submission Instructions >>
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Save the Date for the 2023 Virtual Conference
The 3rd Annual Virtual Conference will be held March 29-April 1, 2023.

Our exciting online platform will provide opportunities for networking, small chat rooms, discussions with exhibitors, and much more.

More information to come soon.

Isometric Dot Diagrams to Solve for Surface Area, Area, and Volume

By Ryan Dent

In my first year of teaching, it has become apparent to me that students do not grasp the idea of surface area on three dimensional objects. While in Math Elites we worked on a project that allowed us to draw an image that we created with blocks. We started this idea by learning what each side of a 1 by 1 by 1 cube looks like in a two-dimensional space then drew the cube on an isometric grid (Figure 1 and 2). When drawing the cube in an isometric grid this show that the cube has depth and can be rotated. The next step in this activity was to create a 2 by 2 by 2 cubes that I used multiple colors to help show that the images are not just replications of themselves, but rather different orientations of the cube (Figure 3,4,5,6,7).

Figure 1

Figure 2

Figure 3

Figure 4

The activity described can be accomplished in the classroom to help students understand area when looking at the two-dimensional view and volume in an isometric orientation. This activity will allow for time for hands-on work that allows students to create their own personal object that they can then draw both the two-dimensional and isometric drawing. With the time to practice the drawings and the concrete representation the activity provides the students should be able to understand area on different sides of their object. Students will have a discussion as a class to talk about how to solve for the surface area of any object when the areas for the six sides are known. This is beneficial because they are using concrete manipulatives finding the area to then finding the surface area and by using the manipulative this will allow the students to see and hold a three-dimensional object has volume that can be calculated.

The isometric view of the object can help show students how objects have depth in a three-dimensional figure. Volume of their object will be reflected by the student being able to count each individual block and adding them together.

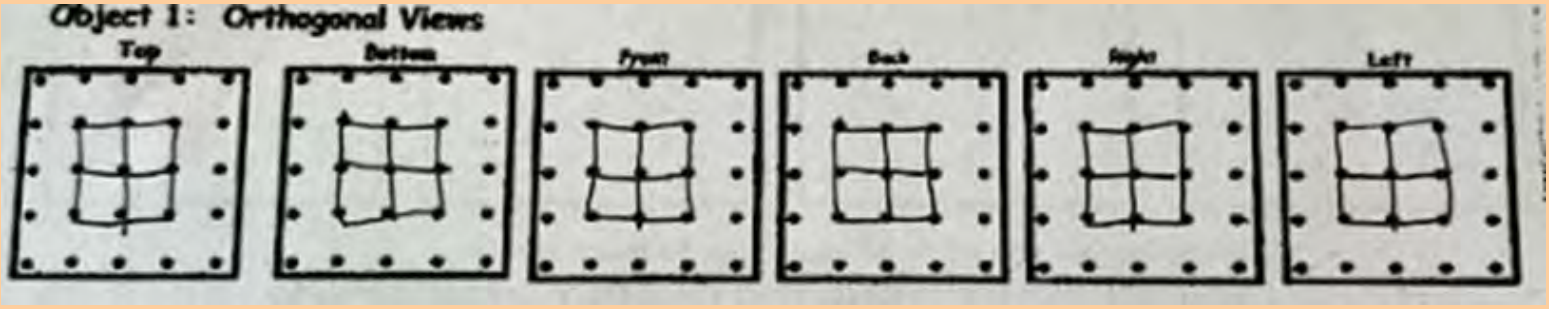

Figure 5

Figure 6

Figure 7

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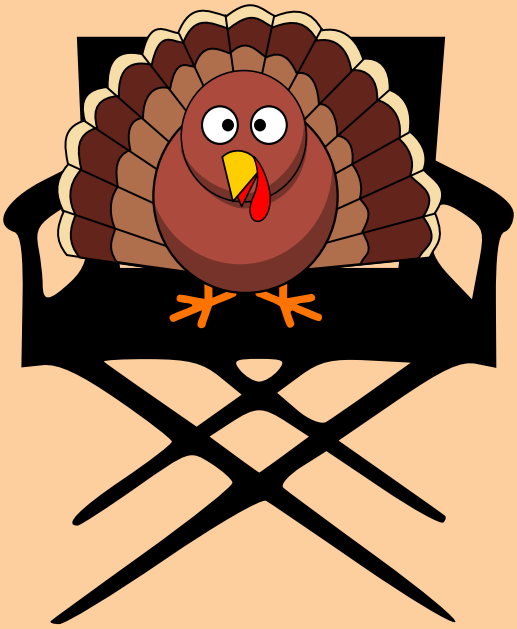
Ready, Set, Act! Implementing 3-Act Tasks in the Classroom

By Andrea Anderson



3-Act Task? What is it you ask? How can it support student learning in my classroom? If you are unable to answer these questions, I encourage you to continue reading to discover more about this engaging and beneficial strategy. Last year (2021-2022), I taught third grade math and science to 2 classes for a total of 42 students. During our geometric measurement unit, I noticed that while my students were able to somewhat easily calculate the area of a rectangle, they struggled with finding the area of larger, more complex shapes that also contained rectangles. The difficulty came from taking a concept they were familiar with and applying it on a deeper level.

My district math coach, Tiffany Hibbitts always shared a plethora of helpful strategies and resources in weekly coaching meetings. During one of those meetings, I shared my concern that students struggled with finding the area of a rectangle in complex shapes. In response, Tiffany introduced the 3-Act Task. She shared how the tasks support and propel students to progress in their critical thinking and problem solving skills in order to become more successful mathematicians. A 3-Act Task is a whole-group mathematics task consisting of three distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three.

She shared multiple resources of pre-created tasks with all of their necessary components and encouraged me to read and explore more about them, and then give them a try. I was intrigued by the resources that she recommended, but to be completely honest…I was terrified to initiate a task of this type! Because of that fear, I procrastinated and did not incorporate these activities into my unit lessons.

During a meeting a few weeks later, Tiffany asked if I had had a chance to try a 3-Act Task with my classes. I confessed that I had not, and then flat out told her I was scared to death. Ha ha! She graciously offered to visit my classroom and lead a 3-Act Task with my students which paired perfectly with the unit I was currently teaching. She led the entire task from start to finish as I observed her modeling and interacted with the students. I was amazed at the depth of my students' thinking and of their problem solving skills as they activated and related their prior knowledge from one of our previous lessons in class. I believe the engaging and unique way of presenting the material and my students' desires to solve the mystery in the task led them to deeper thinking. I led the same task with my second class.

Upon completion of the task, I reflected. I realized two things. One, I needed additional practice using the 3-Act Task. Secondly, WOW, just WOW! The 3-Act Task produced unexpected and extraordinary results. The majority of my students were intrigued and immediately wanted to start another 3-Act Task. Their response to the task was astonishing. The students actually asked to do more math! They were encouraged and delighted with their thought processes and loved sharing with the whole group. Many students related what they learned from other students and thanked their peers for

helping them make connections and/or examine the problem through a different lens related to their learning path and solution. My typically non-sharing and "mimicking" students actually made attempts at solutions and were proud to share their work with others.

My students were hooked, and so was I! Success! 3-Act Tasks...what a great learning tool! If you are intrigued and want to learn more about incorporating 3-Act Tasks into your lessons, I encourage you to get ready, set, act, and take the leap into incorporating these wonderful resources into your teaching. Don't be afraid! You won't regret your decision to dive in! Visit the following websites to discover great starting points to initiate these dynamic tasks into your classroom 🦃

Relevant Links:

https://gfletchy.com/3-act-lessons/

https://whenmathhappens.com/3-act-math/

https://www.sfusdmath.org/3-act-tasks.html#:~:text=A%20Three%2DAct%20Task%20is,and%20solution%20revealing%20Act%20Three

Register for the Baltimore Regional Conference & Exposition

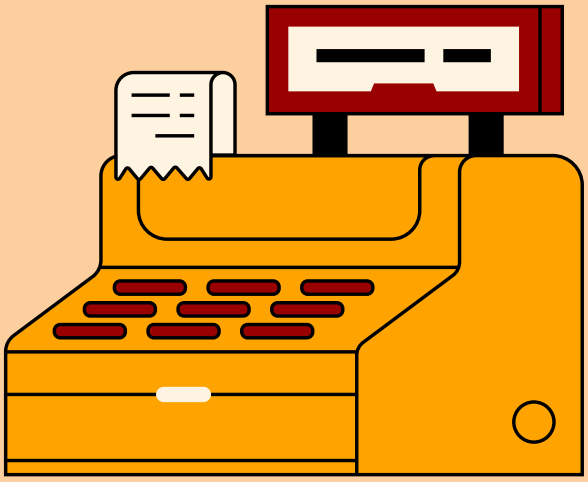
Next month, the mathematics community will reconvene for the 2022 Baltimore Regional Conference & Exposition, November 30-December 2.

Guided by the program theme, Spark Your Math Passion, you can expect to learn, network, and collaborate with fellow math educators from across the region.

Register Today >>

Classroom Economy: Improving Behaviors and Number Sense, One Dollar at a Time

By Heather Gregg



In my eleven years of teaching, I have had the pleasure of teaching across all grade spans within K-6. Most of my experience has included working closely with any behavior concerns within the grade level. With that opportunity, I have always tried to find new creative ways to best help students meet behavioral and academic expectations within the classroom. One of my favorite strategies for grades 3-5, one that can be easily adapted to K-2 and 6-12, is utilizing the classroom economy.

In my experience, one of the most important characteristics of a successful classroom is “Classroom Culture". Positive classroom culture is vital for student growth and success. The classroom economy can help increase positive behaviors, number sense, classroom engagement, and responsibility, therefore, this can help create the positive classroom culture that is so necessary. It is also extremely adjustable so it can fit any need or grade level. The idea behind the classroom economy is using a money system to pay students for positive actions and lose money for unfavorable actions, then students can choose to spend their money in the classroom store or save their money over time. It can also focus more on the positive behaviors for all students, being inclusive to those students who are usually on

task and meeting expectations, rather than these students being overlooked due to their consistent compliance.

Most recently, I had the opportunity to transfer to a new district and new grade level mid-year. There were quite a few behavioral issues in this class. I desperately needed to implement something quickly to decrease disruptions, while also building connections with my new students. Immediately, I thought about the classroom economy. I knew it could be used to reward students for many aspects in class where behavior could be improved. I asked my students for their input on where we could improve behaviors and what things would motivate them. Their suggestions included hallway behavior, related arts behavior, receiving zero marks throughout the day, and participating in class. They also wanted more freedom in choosing a classroom job and be paid for quality completion of that job. I took all of their suggestions and built our plan to implement the classroom economy.

First, students were given a list of classroom job titles and the description of expectations within each job. Then, they filled out an application for all the jobs they were interested in, describing why they were qualified for that job and why they would be successful in that role. I took all applications and hired the best fit for each job. Some students had more than one assignment, while others didn't have a job at all if they didn't apply for one. In addition to earning money for completing their job, students earned money for the categories they had given. I kept a weekly sheet that helped log their attendance, marks for behaviors, related arts behaviors, and anytime they were caught doing something great. Students were paid once a week, on Monday, so I

had Friday afternoon to tally everything up and sort everyone's pay from the week.

As students began earning money, they made decisions on spending or saving their paychecks. I opened the classroom store every two weeks, but this could be adjusted to fit your schedule. Every other Friday, students would count up their money and look over the items available in the store to decide what they wanted to purchase, if anything. To save on my out of pocket spending, a large majority of the items available in the store were coupons, like Stinky Feet where they could remove their shoes while in the classroom, Bring a Stuffed Animal, Sit with a Friend, Crazy Color where they could use colored pens that day, Switch Homerooms, Switch Related Arts class, Eat Lunch with a Teacher, Extra 10 minutes of Recess, and much more. The students helped create those coupons based on their desires for rewards. I did keep a small amount of small treasure box items, large treasure box items (from the dollar store), and some snack items. The first few times students were very excited to spend their money, but many realized they preferred to save up for the bigger expense items. At the end of the year they were able to buy several big expense items and this helped to contain that end of year chaos.

Overall, I thoroughly enjoy giving the students something exciting to work hard for, as well as rewarding their hard work and dedication to learning. I find so much joy in watching them learn about how their choices directly affect their rewards, internally and externally. They are learning valuable lessons about economics while having fun doing it. To get started, all you need is a set of fake dollar bills

and a plan for what and how you want to pay students. If you are looking for a new strategy to use in your classroom to build engagement, decrease disruptions, and increase student responsibility I highly suggest giving the classroom economy a try.

Go With the Flow

By James "Tyler" Hensley

One of the most frustrating areas in teaching is students' lack of effort and perseverance. We live in a world where we can “google it” to find the answer to any questions we may have. Since we have so much information at our fingertips, it has made adults and also children have the mindset that answers should be found quickly. The fast paced world has entered into the classrooms all across the country. Students race to be first in assignments and feel like they are not smart if they don't finish first or before a majority of the class is finished. When assignments are challenging and students have to analyze a problem in order to solve, they tend to shut down. Likewise, if the problems are too basic, the students will become unengaged and experience boredom. Why is this? How can we as educators create a better learning environment that keeps students engaged and increases the rigor of assignments?

Peter Liljedahl, author of Building Thinking Classrooms in Mathematics, discusses flow and how it can drive thinking in the classroom. Liljedahl defines flow as, “The space where there is a balance between the ability of the doer and the challenge of the task.” It is important to keep your student in the area of flow so they don't reach a state of frustration or experience boredom. All students will reach frustration or boredom differently. As the students' abilities increase, we must increase their challenge to keep them from experiencing boredom. However, if the challenge is

increased before a student has reached understanding they will be pushed into frustration. This could lead to the student shutting down or disrupting the learning environment. Likewise, if we wait too long to increase the challenge, we push them into boredom.

Liljedahl introduces the idea of thin slicing which "refers to sequencing a list of problems in such a way that the increase in the challenge from one task to the next is incrementally small. We push the envelope a little bit in each step, which helps keep students in flow and reduces the chance of pushing them into frustration by making cognitive leaps too challenging." So what are some areas in your classroom where you can implement thin slicing?

As we approach this upcoming school year, I plan to implement thin slicing while teaching order of operations. Start with a basic operation and start adding parentheses or exponents. This will allow

classroom discussion as to why the answers change when you add parenthesis or exponents and why we must follow the same order to solve correctly. What are some ways you can implement this in your classroom? In closing, it is vital to the learning process to stay within the flow of frustration and boredom. Student engagement and perseverance should be at the forefront of the classroom.

Upper East Tennessee Council of Teachers of Mathematics

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