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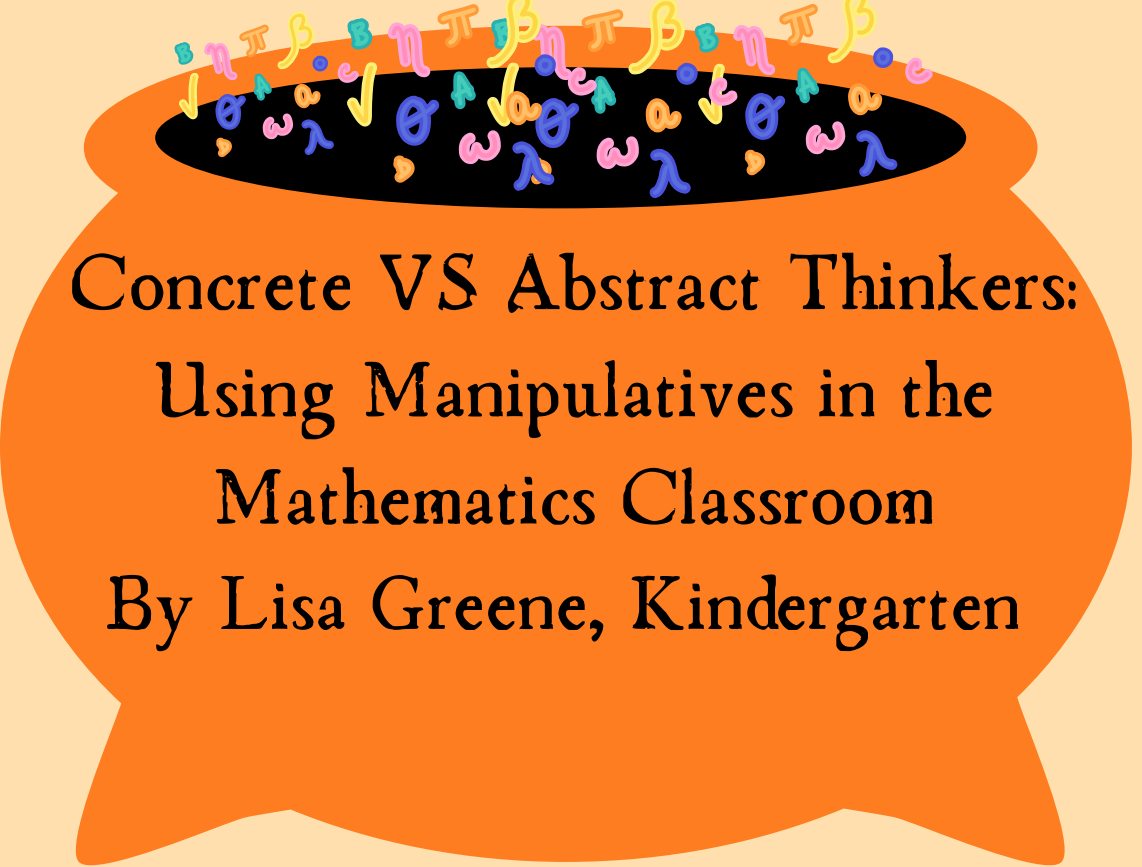
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**Concrete VS Abstract Thinkers:  
Using Manipulatives in the  
Mathematics Classroom  
By Lisa Greene, Kindergarten**

Could you have a conversation with someone who spoke a language you had never heard before? I had never thought about it that way but learning about numbers is a lot like that to some children. Some students come to the kindergarten classroom able to make sense of numbers and can manipulate them multiple ways on their grade level, while others may struggle.

Number Sense, in kindergarten is the ability to understand numbers to manipulate them and solve mathematical problems. If students do not have the ability to learn number sense, it will sound like a foreign language to them.

When teaching students, it is important to take into consideration abstract vs. concrete thinking. Concrete thinking is based on facts and what we see. Whereas abstract thinking is based on

ideas and understanding multiple meanings of things and the ability to think “outside the box” of just what we see in front of us, to think deeper than the concrete. Most children think in the concrete while most adults have graduated into the more abstract way of thinking. There are, however, situations where a person does not have the ability to think beyond the facts or what is seen and will be a concrete thinker into adulthood. While attending a math training for MathElites this summer, I was introduced to the idea of what it is like for the concrete thinker to learn that numbers can be manipulated and used in various ways, thus what it may be like for that type of thinker to sit through math class daily and not understand what is going on.

To start with, I believe it is important for students to know and understand that numbers are not set in stone. In other words, we can manipulate them in ways that show that we rule numbers because we can move them around and represent them in ways that correlate to our way of thinking. When we are successful in teaching to the two ways of thinking, I believe the typical kindergarten student will be more apt to understand numbers and number sense. Teaching number sense can be tricky as well if we as teachers do not have the ability to think both concretely and abstractly. Therefore, teaching numbers and number sense multiple ways is a must in the classroom for all students to be successful mathematically.

Some strategies and manipulatives that can be used in the classroom while teaching number sense are: Subitizing

and Splat, two games that show specific numbers in varying ways such as the number five by holding up five fingers on one hand vs holding up two fingers on one hand and three on the other, showing five counters in a ten frame vs one counter in a ten frame and four in another, etc. These two games are fast paced and flashed on a screen and the student must guess the number quickly. Also, by using ten frames, connecting blocks, teaching place value, using counting rods, number lines, just to name a few manipulatives that are used to teach number sense, a student will come to understand that numbers can be represented in different ways. The use of manipulatives is very important for all learners especially for those who think concretely and should never be restricted to just lower grades.

I have always known that everyone does not think or learn alike and how important it is to try to reach all learners in your classroom. But I will admit that sometimes I struggle with this. I like to think of myself as a life-long learner. I have been teaching for 17 years and I have for the first time, just this summer had a visual representation of just how hard it may be for the different types of learners when it comes to Number Sense. The use of manipulatives in the math classroom is a must! If you are a teacher of mathematics and you do not make regular use of manipulatives in your classroom, no matter the grade level, you and your students are missing out. 🍁

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# **BUT WHY?**



By Whitney Tapp



Most of you reading this are educators. Some of you are parents. But we all know those (let's be real) kids who drive you bananas and ask "why" to every single thing. My child was one of those kids, still is, and he is 11. For 11 years, I have tried to be patient. I have tried to answer all of his "whys". There are just some days my answers are "because it just is" or "because I said so". I am guilty of using these easy answers to questions that are obviously important enough to him that he wants a deeper understanding of said topic. I am also guilty of doing the same thing in my classroom. Who do I think

I am denying these curious minds of the knowledge they are longing for? Just because I "don't have the time", or I'm "not in a great mood", or I am "tired" doesn't mean I should not educate. That is my passion and I owe it to them. As a parent and as a teacher, my duty is to instill a love of learning into the hearts and minds of children, so they can continue to have that hunger for knowledge.

So many times we (parents AND teachers) disregard those "whys" so much, at what point do children get tired of not getting the answers they are seeking and deserve? At what point do

**they stop wondering why? At what point do they lose their interest in learning? All because they have been denied answers to such simple questions beginning from the time they can talk.**

**So what happens next? They have now lost interest in deeper thinking. They have been conditioned to stop asking why. They start school, learn what the teacher teaches them, mimic how the teacher solves problems, memorize their math facts, and move on to the next grade year after year. Then they get into more advanced math in middle school and high school. They are asked to show multiple ways to solve an equation. “Multiple ways!?! But there is only one way! The way Mrs. Yawn had me write 50 times because I kept getting it wrong.” Unfortunately, we all know that song and dance.**

**Instead of just mimicking, instead of just memorizing, we should be teaching the “why”. We should be teaching the different strategies. There IS more than just one way! Life is not a “one size fits all” kind of deal. Don’t make these kiddos wait until they are 33 years old, in MathElites, to realize all of the different ways to strategize! Give them the only opportunity they may ever have. Give them all the tools to construct their own bridge to understanding, instead of making them use your blueprints. Answer their “whys”, but more importantly, be their “why”. 🍁**



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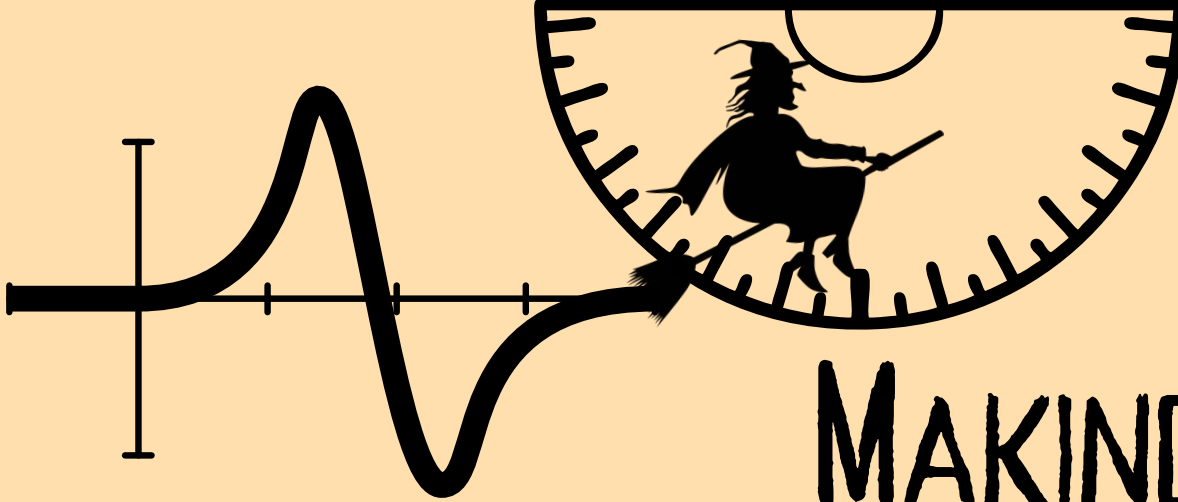
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# MAKING ROOM

By Shelby Burleson

My experience in Math Elites has given me a fresh perspective on the incredibly important work we do in elementary math classrooms. Elementary math teachers have a huge responsibility in setting the foundation for students to grow in their problem solving skills by encouraging their curiosity, developing focus, and making sense of everyday problems. Elementary math is not a closed, isolated place where concepts are taught, practiced, assessed, and then stored away in short term memory. Elementary math helps to shape tolerance for productive struggle, repeated attempts,

and “messy” problems with not messy solutions. Elementary teachers have a vital responsibility in modeling and encouraging flexible thinking and “making room” for students to feel comfortable in trying something that may not entirely make sense to them at first glance.

Developing student interest in math and its practical applications is crucial for success throughout a student’s k-12 education. Three act tasks are an effective way to develop interest in everyday situations that encourage students to notice and

wonder about common everyday occurrences. These tasks “make room” for students to consider how math is everywhere and is an important tool that is essential for success in many life situations.

Many students come into third grade with very specific attitudes and perceptions of their personal skill level and their ability to solve mathematical problems. At “meet the teacher” night, I often have parents say “he doesn’t like math”, “she is better in literacy”, or “he just doesn’t get math”. This is a disheartening reality that we as elementary math teachers must work to undo. All students are capable of using mathematical skills to solve a variety of problems successfully. Being the first student with an answer doesn’t mean that you “get

math”. Struggling to visualize a volume problem doesn’t mean that you are “bad at math”. Elementary teachers have a responsibility to “make room” for productive struggle and frequent collaboration with randomized groups so that students can be comfortable in not immediately knowing an answer and be confident in trying an entry point, knowing that the task may require several attempts. Math is not a maze with doors that only open for some people who can solve problems quickly and get the right answer the first time. Math teachers “make room” for students to skip, walk, hop, or even dance through a maze without fear of an upcoming door that may or may not open on the first try.

Even though third grade students do not practice activities involving negative numbers, rational numbers, decimals, and factoring, we made many connections between foundational skills that are practiced and mastered within the elementary classroom that are absolutely necessary for success in these concepts and grades 6-12. Elementary teachers help students by “making room” for them to consider that our number system is guided by patterns, and using a flexible approach to working with numbers will help students problem solve with confidence. 🍁

I am thankful for this opportunity to collaborate with other professionals from East Tennessee/Southwest Virginia to focus on relevant activities that will help our students to be life long problem solvers who can persevere and use mathematics to budget their money and time, solve problems in professional and personal settings, and inspire others to find meaning and make sense of the world around them.

-Shelby



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# Teaching Math Using...

# SCIENCE?



By Erica Horton

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I found myself in the summer of a transition year for me. I was moving to a new school and teaching a new subject. All I had known for many years now was science. I LOVE science! ♡ I constantly thought of ways to improve my lessons and students' learning. Over the last few years, science teachers were taught a new way to go through a science lesson called 5E. The five Es stood for Engage, Explore, Explain, Elaborate, Evaluate. Of course engage would be getting your students' attention, getting them excited for what they will learn. Explore is having an activity or discovery about the topic BEFORE anything is even taught. Explain is the main part of your lesson, where all the

teaching/explaining happens. Elaborate deepens understanding of the topic and allows students to apply the knowledge they learned during the "explain" portion of the lesson. Lastly, evaluate is when students show what they learned and understand. I was a skeptic on this style of lesson, especially the "explore" part. How will students be able to do an activity on something they haven't been taught? They don't know the vocabulary! I haven't front-loaded a ton of information that means nothing to them yet! How will they ever understand?

If you haven't figured it out, my mind was completely changed after teaching my first lesson using 5E. Focusing on the "explore" portion of the lesson, students were engaged, excited, and curious. Students that didn't have background knowledge now have an even playing field through a common experience with the rest of the class. Throughout the "explain" portion of the lesson, I could reference "explore" and make connections resulting in building comprehension through the experience. I use this for ALL my science lessons.

While attending Eastman's MathElites this summer, I learned so many ways of explaining how things "work" in math. We used number lines, pattern blocks, inch tiles, ten frames, Unifix cubes, and other manipulatives. I started thinking about how I could incorporate the 5E concept of discovering math first using the CRA approach, THEN teaching the

concept. The CRA approach is a concept that I learned during my time at MathElites. It stands for Concrete, Representational, and Abstract. Concrete is making math hands-on, which usually means that students are using manipulatives.

Representational is when kids draw a representation or model of the math they are performing. Lastly, Abstract is when students use the numbers and algorithms to solve math. Having all three of these in a math lesson allows students to make the critical connections needed for understanding the mathematical concepts as well as storing it in long term memory.

I felt that putting my idea to the test would be best, so I decided to use it in a math lesson plan. I decided to make my MathElites lesson

plan into a “5E style” by starting with a 3 act task. I teach 5th grade, so I chose the following standards:

**5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.**

**a. Understand that a cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.**

**b. Understand that a solid figure which can be packed without gaps or overlaps using  $n$  unit cubes is said to have a volume of  $n$  cubic units.**

**5.MD.C.4 Measure volume by counting unit cubes, using cubic centimeters, cubic inches, cubic feet, and improvised units.**

I used the 3 act task Packing Sugar | Questioning My Metacognition by [gfletchy.com](http://gfletchy.com). It is very important that students are not taught a lesson before this task since the whole goal is for students to build their own knowledge and understanding by doing. In act 1 (engage), students are shown a video clip of a box of sugar cubes and one cube sitting beside it. Students are asked “What do you notice? What do you wonder?” This gets students curious and excited for what is to come. Act 2 (explore), it is revealed that students will determine how many sugar cubes will fit in the box. Students will discuss their thoughts, then they will be shown a picture of how the sugar cubes are arranged in the box, meaning side-by-side, no overlapping, and no gaps. Students will then be shown a picture of the amount of cubes in the box arranged in layers. Students will use manipulatives (actual sugar cubes or base ten unit cubes) (concrete),



drawing (representations), and the numbers (abstract) to solve . As the teacher, if students solved it only one way, he/she would challenge them to solve it a different way. As students finish this portion of the task, act 3 would be a whole-group discussion on the different methods used to find the correct amount of cubes. At this point, the teacher would be a guide for students figuring out that they were finding the volume of a rectangular prism and ask students to create an equation that they could use to find the area of any rectangular prism. After this activity, in the “5E style” lesson, it would lead to the explain/teaching portion and progressing into extend and evaluate, which involves the practice and assessment of the concept.

The meshing of my new knowledge from MathElites with my 5E lesson science knowledge worked out quite nicely in a math lesson. Students are given all the necessary information to understand this new math concept all on their own and then apply it in other situations and problems in math. I cannot wait to see the results in my math classroom! 🍁



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# INCREASING MATH FLUENCY WITH GIMKIT BY LEANN OVERBAY

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Have you ever stated, “my students just don’t know their multiplication facts”?! I admit, I have! I understand that it hinders the ability of the classroom to flow faster when students don’t know their facts or even their fact families. I think we can all agree that calculators have created a slight learning curve when students have to take the time to punch in numbers on a calculator rather than spitting out the answer within a second.

However, have we stopped to think, “what can I do about it in my classroom?” After a brief study on how to increase student fluency, I believe I’ve found a way to incorporate building this much needed math skill into my classroom



According to the Institute of Education Sciences, What Works Clearinghouse, there are six recommended practices to incorporate into the classroom that will guarantee an increase in student achievement. These recommendations especially work for those students that struggle with mathematics but can also be used to increase student achievement with higher level students.

One recommendation specifically recommends regularly timed activities as one way to build fluency. The

first step is to identify the topic, implement a plan and to use it frequently. Secondly, choose the activity, materials needed and the amount of time. Reflection at the end of the activity is suggested for incorrect answers. Thirdly, the What Works Clearinghouse suggests teaching students strategies for efficiency before the activity and even to remind the students about the strategies beforehand.

After the activity, it is recommended that students own their data through graphing their progress. It's important to keep in mind that when completing the activity individually, to keep that data private. However, if the activity is through grouping, the data can be displayed publicly to the class. Finally, immediate feedback during or after the activity is recommended. This could be in a variety of ways

correcting errors using the strategies previously discussed, explaining verbally in a one on one session or through written expression.

A media activity that I have recently used in my classroom for practicing math skills, called GimKit, is a resource that I plan on using in my classroom this coming year to help increase math fluency even more. GimKit provides students with a multimedia application for learning math fluency and fits into the What Works Clearinghouse parameters for the recommendation previously described. It is free with ten "kits" but can be purchased at the school level. Teachers can create their own kit, which is a set of problems with or without answer choices, or search for previously made kits.

Teachers have the ability to choose the amount of time for students to play, race as a class to a specific goal, or when one individual student reaches a

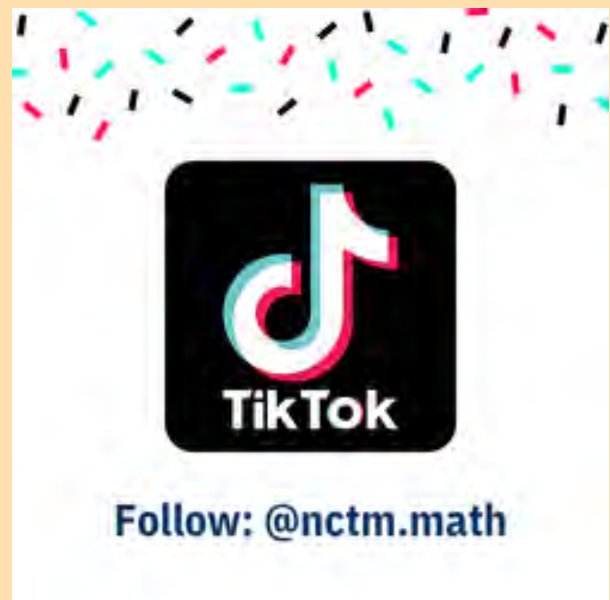
goal. Teachers also have the option to show students the correct answer when incorrect answers are given.

When the kit, or game has started, students answer the questions randomly. In order to “play” the game mode that is chosen, correct answers have to be given. Correct answers give students a virtual amount of cash or energy if in game mode. When incorrect answers are given, the student’s power to play is decreased, or money is lost.

At the end of the allotted time, students can view their score on their own screen while teachers can “view the report” to see the class as a whole, each individual student or even by grouping.

In conclusion, GimKit is a media that can be used in several ways within the classroom. Students can practice answering questions towards any specific skill that

you, as the teacher, want them to be fluent. Difficulty can be increased with each play by taking away multiple choice answers and allowing students to type in the correct answers. Students can also graph their progress over time and feedback is also an option. All of which fit the What Works Clearinghouse recommendation for increasing math fluency. 🍁



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# Classroom Management

## by Barbara Stout

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As every teacher knows, classroom management can make or break your school year. It can be a tricky line between making sure students learn the standards and enjoy your class. These two things should go hand and hand, but as the pressure of the school year builds it's very easy to fall to one side or the other. It takes a magical combination of lesson planning, engaging activities, motivation, and classroom management. I will be focusing on the latter.

As a seventeen year teacher of middle school mathematics I have found some great strategies for classroom management. I have also had to adjust my expectations just to make it to the end of the school year



with some classes! It's important to have basic procedures and standards for your classroom, and that these procedures and standards are clearly communicated to all students. It's also important to be somewhat flexible and understand that not everything will go as expected.

I begin the very first day with handing all students a folder with math vocabulary and my classroom procedures inside. My procedures are simple and basic. They include paper distribution, bathroom, calculators, tardiness,

makeup work, grading policies, supplies, lockers, answering/asking questions, etc. We practice these procedures frequently during the first two weeks. After that they usually become second nature in my classroom.

Students knowing the procedures and expectations ahead of time allows for much smoother classes and transitions. It also allows for fun, organized, chaotic lessons where everyone knows their role and expected behaviors. This is not to say that everything always runs like clockwork, but issues are kept to a minimum.

I have also had to throw my procedures out the window and go into survival mode to get through the year without crying everyday! I've had a few classes that I've made a behavior chart for. I gave a check mark for any interruption to class.

If a student had three check marks they got no candy. Two check marks got 1 piece of candy. One check mark got two pieces of candy. No check marks got three pieces of candy. For these classes I no longer worried about students being prepared and having supplies, or even if they had their work from the previous day. I concentrated on making it through the class with most of the students learning something mathematical.

A good classroom management plan implemented at the start of the school year can be the difference between a very successful school year and a less successful school year. Every teacher's goal is to have maximum learning with minimum behavioral issues and interruptions. Constructing and implementing a plan that meets the needs of you and your students should be the first step in achieving a successful school year. 🍁



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