

# Moving Through Math



Giving students the opportunity to experience math through a wide range of learning modalities

*At a time when United States math scores are at an all time low, we need to authentically investigate the methodology of an individual child's learning process to determine whether he or she is actually gaining knowledge. Studies show that many students are bored, falling behind, and increasingly finding mathematics irrelevant. And increased classroom ratios have negatively affected the educator's relationship with the individual student. Furthermore, while educators know that conceptual foundations are imperative for achievement in mathematics, concepts are often inconsistently built upon from one grade to the next. Given these challenges, it has become essential to utilize an approach that has a proven track record of success.*

***Moving Through Math*** is a research-based approach to primary mathematics. It is the only curriculum that enhances conceptual knowledge through the integration of movement, social learning, discussion, and reflection. Creator of ***Moving Through Math***, Marcia Daft, found that terms like *engagement* and *excitement* were not typically associated with primary school mathematics; however, both make learning math natural and less aversive for students. ***Moving Through Math*** lessons are directed to alleviate that discrepancy.

When learning is physically and socially active, students typically grasp concepts more quickly with greater enthusiasm, which is apparent in ***MTM*** lessons. With ***Moving Through Math***, there is no rote memorization. Students learn math concepts and discover how different concepts relate to each other -- leading to deeper, longer lasting retention.

Teachers who use ***MTM*** lessons have the rare opportunity to understand individual student's strengths and weaknesses. Because this method of instruction is visual on a large scale, social, and movement based, teachers can immediately see and diagnose gaps in student comprehension. Assessment is literally built into each moment of instruction, driving a dynamic relationship between teacher and student.

***Moving through Math*** is a curriculum that immediately engages children and helps them become eager to learn the foundational skills required to be successful in math.

## **Moving Through Math addresses Teaching the Whole Child & The Common Core Standards: Involving *all* learning modalities**

*Moving Through Math* addresses Teaching the Whole Child and the Common Core Standards by pulling the instruction from the blackboard and empowering students in their education. The phrase “*teaching the whole child*,” is meant to portray a learning environment in which multiple senses, or multiple learning modalities, are being targeted. Marcia Daft created *Moving Through Math* to include all learning modalities and enrich the academic experience for all types of learners. Commonly, a math lesson uses verbal and visual skills; but the addition of *movement, music, spatial reasoning, and interpersonal skills* takes the lesson from static to dynamic. A study conducted by Rogers (2009) found that using a variety of teaching techniques including movement led to greater student participation and enhanced performance. Another study conducted by classroom teacher Karen Wood (2007) observed that teaching through kinesthetic modalities [movement] leads to deeper student concept formation and a better ability to communicate understanding, making assessment more accurate. Teaching the whole child not only means effective instruction but also better assessment, more engagement, and deeper conceptual outcomes.

“[With *Moving Through Math*] students represent their mathematical understanding in a variety of ways -- through pictures, stories, rhythm, creative movement, and verbal discussion that emphasizes the accurate use of math vocabulary. They also represent their understanding using math manipulatives and traditional numbers and equations. It is our belief that each time a student expresses his or her understanding through a new modality; the learning becomes richer and deeper. We also believe that through the discovering the interconnectedness of ideas, students are led to develop higher order thinking skills.” (Dr. Victoria Brown, 2010)

The Common Core Standards provide clear guidelines of *WHAT* students are expected to learn from grade to grade. The Common Core Standards also highlight the importance of conceptual understandings, verbal reasoning, and collaborative learning: all key components in *Moving Through Math* (see fig. 1.0). Unfortunately, there has been very little direction about *HOW* to achieve the Common Core Standards statewide. *MTM* fully aligns with the Common Core Standards by providing detailed lessons that first teach solid foundational skills, then scaffold into complex concepts, and ultimately facilitate higher order thinking and problem solving skills.

The Common Core also places emphasis on student performance of understanding as a key part of the learning process. Dr Hannaford, neurophysiologist, educator, and author of Smart Moves: Why Learning is Not All In Your Head, presents that sensorimotor experiences effect short

and long term memory. Her views have been supported with scientific research in development, physiology, and neuroscience to present evidence that movement is vital to learning (2005). The Common Core emphasizes the importance of non-mechanical, creative approaches to teaching math, which are ingrained into every *Moving Through Math* lesson.

### Student Engagement

Student engagement is a vital underpinning for all learning. While the term is difficult to define, both psychologists and teachers agree that specific behaviors are observed in students that are engaged in their learning: they are actively thinking about the material, they display on-task behavior, they display self-directed learning, they are participating, and can identify with the lesson. The correlation of student engagement to comprehension is very direct; high levels of engagement lead to comprehensive understanding and conversely, low levels of engagement show poor results. Considering that engagement is so essential, Marcia Daft emphasizes its importance in the *Moving Through Math* curriculum.

**"When I see a child in a classroom blankly staring out the window, picking at the pencils and wrappers inside her desk, or focusing all his attention on rocking back and forth in his chair, I know this child is not engaged in learning. What does engaged student learning look, sound, and feel like? It's noisy and exciting! Children are busy talking to each other and sharing ideas. They are excited to use their bodies in creative ways to represent their mathematical thinking. Kids are collaborating with partners or**

**in small groups to discuss, create, and perform their own math solutions. Students anticipate presenting their own work as much as they anticipate seeing what other student groups have created. *Moving Through Math* embraces children's laughter, their joy in learning, and their pride in mastery. (Daft, 2012)"**

In a study conducted by Indiana University's Center for Evaluation and Education Policy, over 98% of students reported being bored in their respective classrooms (2012). *Moving Through Math* yields high levels of student engagement due to many factors, the most simplistic of which being that it is fun and interactive. As one student commented, "I used to hate math but with *Moving Through Math*, I didn't even know I was learning; it was so fun!" When a small group of kindergarten through fourth grade students were asked about their preference in learning modalities, they unanimously reported their preference for movement, music, and 'friend based' instruction. A happy, engaged student is a student who is learning.

### Comprehension over Memorization

Repeated drills, chanting math fact raps, and other activities are often used for memorization, but is the concept actually understood? And how does a teacher know if her students have simply memorized facts or actually grasped the underlying ideas? While many teachers know they want their students to comprehend materials, it can be complicated to figure out how to create this type of learning environment in their classroom. *Moving Through Math* builds a deep

comprehension of concepts because students are actively seeking meaning instead of having the teacher provide it for them. For example, when students are learning the concept of grouping, students physically move around the room and divide themselves into different groups, and then explain the reasoning behind their grouping. Students learning about number lines will physically create a number line and then discuss reflection questions about the significance of different positions in the line.

In *Moving Through Math* the focus is on developing each student's ability to create and analyze instead of just giving the right answer. Involving all the learning modalities helps students not only relate to the material better, but also gives them the ability to see mathematics as dynamic concepts instead of memorized, one-dimensional skills. With *Moving Through Math*, students are thinking, asking questions, and making verbal reflections about how math works and why.

In a *Moving Through Math* lesson, students move away from linear thinking and into networked thinking,

discovering the relationships *between* ideas. Students demonstrate and deepen their understanding through teacher prompts such as, "How would you describe it? Who sees it differently? Who can use different words to describe this?" An elementary teacher using *MTM* commented, "Students learn concepts better and quicker when they can see them, feel them, and talk about them with their peers."

**"With this method of teaching math, in my first year of teaching I had a 94% pass rate on the state test with 68% scoring advanced. In my second year, I had 100% of students pass and 77% scored advanced ratings. I know that it is because with *Moving Through Math* students move from memorizing to understanding. It gives them real experiences. *Moving Through Math* is the difference between satisfactory scores and advanced scores. For some students, it is the difference between passing and not passing. *Moving Through Math* is the reason that I love teaching math and my students love learning it." (Elizabeth Ejdehadi, 3<sup>rd</sup> grade teacher, Wilson Elementary, Oklahoma City, 2012)**

## Example Lesson 1a: Moving Through Math

Math Concept	Moving Through Math lesson	Assessment/ Reflection
<p><b>Number Comparisons (grades K-1)</b></p> <ul style="list-style-type: none"> <li>• Greater than</li> <li>• Equal to</li> <li>• Less Than</li> </ul>	<ul style="list-style-type: none"> <li>• Grouping Game: Students work in groups.</li> <li>• Within each group, students create a frozen picture (tableau) using their bodies.</li> <li>• Their challenge is to create a frozen picture that shows number equality or inequality, AND to express the significance of this numerical relationship.</li> <li>• Each group practices using concise mathematical language to label their creative presentation.</li> </ul>	<ul style="list-style-type: none"> <li>• Students use clear language, facial, and bodily expressions to perform their understanding of number relationships.</li> </ul> <p><i>For example, "We are in a group of 6. There are 3 skydivers and 3 parachutes. 3 is equal to 3. Whew!"</i></p> <p><i>For example, "We are in a group of 5. There are 4 hungry gorillas and 1 zookeeper. 4 is greater than 1. Help!"</i></p> <ul style="list-style-type: none"> <li>• Students draw individual portfolio pictures that show numerical equality or inequality. Students use precise language to label their drawing.</li> </ul>



We are in a group of 4. 1 is a bird and 3 are fish. 3 is more than 1. Lucky bird!



We are in a group of 5. 1 is a table and 4 are chairs. 1 is less than 4. That's good because a table needs 4 chairs!

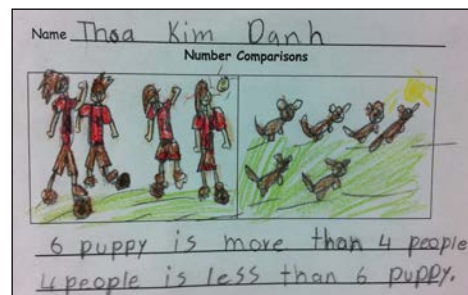
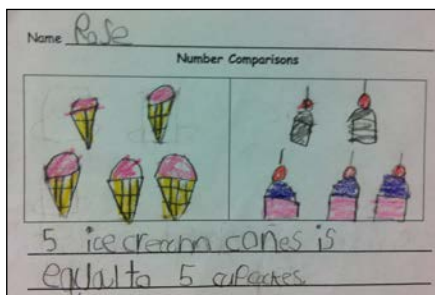


Figure 1a. Example of lessons taught during Moving Through Math



## Example Lesson 1b: Moving Through Math

Math Concept	Moving Through Math lesson	Assessment/ Reflection
<p><b>Repeating Patterns (grades K-2)</b></p> <ul style="list-style-type: none"> <li>• Constructing and deconstructing groups</li> <li>• Part-to-whole relationships</li> <li>• Repeating equal groups</li> <li>• Pattern Labeling</li> <li>• Pattern Units</li> <li>• Pattern Naming</li> </ul>	<ul style="list-style-type: none"> <li>• Students work with partners to create rhythmic movement patterns using their bodies. <i>For example, "twist, jump, jump, bend; twist, jump, jump, bend..."</i></li> <li>• Each pair practices using clear and concise mathematical language that shows their understanding of how their pattern is constructed.</li> </ul>	<ul style="list-style-type: none"> <li>• Students take the role of teachers. Student pairs come to the front of the room to perform their movement patterns. After performing, student teachers call on classmates to ask key questions:</li> </ul> <p><b>Q1</b> "Perform our repeating pattern." <i>(twist, jump, jump, bend; twist, jump, jump, bend...)</i></p> <p><b>Q2</b> "Perform our repeating pattern and label it with alphabet letters." <i>(ABBC; ABBC...)</i></p> <p><b>Q3</b> "Perform one pattern unit." <i>(ABBC = twist, jump, jump, bend)</i></p> <p><b>Q4</b> "What is the addition number sentence that shows how our pattern unit is constructed?" <i>(1 + 2 + 1 = 4)</i></p> <ul style="list-style-type: none"> <li>• Students draw individual portfolio pictures of repeating patterns.</li> </ul>



Figure 1b. Example of lessons taught during *Moving Through Math*

## Example Lesson 1c: *Moving Through Math*

Math Concept	<i>Moving Through Math</i> lesson	Assessment/ Reflection
<p><b>Geometry: (grades K-3)</b></p> <ul style="list-style-type: none"> <li>• Line orientation               <ul style="list-style-type: none"> <li>• vertical</li> <li>• horizontal</li> <li>• diagonal</li> </ul> </li> <li>• Angle               <ul style="list-style-type: none"> <li>• acute</li> <li>• right</li> <li>• obtuse</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Students work with dance bands to perform their understanding of line. Because they are using their bodies, and not simply looking at flat 2-dimensional paper, they can rotate their lines through 3-dimensional space.</li> <li>• Students collaborate with partners to build angles.</li> <li>• The teacher observes the class moving. She can easily see when it is appropriate to suggest more complex spatial and movement challenges.</li> </ul>	<ul style="list-style-type: none"> <li>• Students use their bodies to create frozen shapes composed of lines and angles.</li> <li>• Students perform their frozen shapes for the class.</li> <li>• Classmates respond to each performance using clear and concise language. For example, “I see an obtuse angle. They are making the angle with their legs and spine.”</li> <li>• Students draw individual portfolio pictures of lines and angles.</li> </ul>

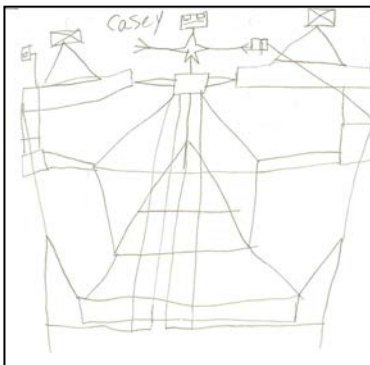
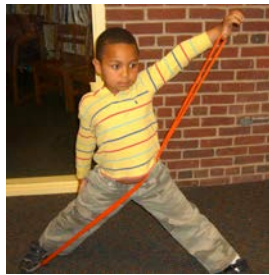


Figure 1c. Example of lessons taught during *Moving Through Math*

## Relevant Math

In the study conducted by Indiana University cited previously, 75% of students reported being bored in school because the work was not relevant; they did not think they would ever actually use the skills being taught. This is a very common phenomenon in math; students don't understand how math works in their daily lives.

***Moving Through Math*** purposefully directs students to make real world associations and generalize their skills. Marcia Daft's lessons, as opposed to typical teaching standards, are not arranged to teach skills and then leave the students to figure out the real world relevance. For example, during a grouping lesson, students use their bodies to create cat and dog groups, tree and shrub groups, etc. After this lesson, children look out their car windows and immediately identify groups, saying "Look, two animal groups -- cows and horses!" or, "Look, three parking groups -- bikes, motorcycles, and cars!" For example, during an equal grouping lesson, students draw groups of two in pairs of shoes and rows of eggs in a carton. After this lesson, children can immediately identify groups of two, saying, "Look, two squares of glass in each row of the window!" or "Look, a pair of earrings is a group of 2!" ***Moving Through Math*** makes lessons part of the child's every day life, not just part of the classroom or a requirement for their grade.

***Moving Through Math*** helps bring the child to a level of awareness about the physical environment and how it

relates and displays mathematical concepts. ***Moving Through Math*** also fosters creativity and problem solving skills, which in turn are immediately utilized at home, on the playground, and throughout children's lives.

**"After a *Moving Through Math* lesson and then a long school break, students were able to remember the concept of coin value, self-correct, and accurately perform the roles of student and teacher. This was possible because of the multimodal approach that *Moving Through Math* offers. Students learn concepts in multiple ways, which allows them to draw on all their experiences to remember how to do something, like count the value of coins. I have had the most successful school year with math concepts, thanks to Marcia's lessons. I have seen truly fantastic results and students love this way of learning!"**

## Reaching the Hard to Reach Students: *Moving Through Math* for ESL and Diverse populations

While verbal language is very important, non-verbal language and movement can be equally powerful in the classroom. English-language learners engage fully in ***MTM*** lessons. They can watch their classmates modeling math concepts and jump into the learning process. Language is not an insurmountable learning barrier when the right instructional techniques are in place.

Struggling and below-grade level students collaborate in small groups with students working at grade level. Students work together in these small groups to construct, demonstrate, and verbalize meaning. Students have the opportunity to work on their weaknesses while capitalizing on their



strengths. Weak students are consistently supported and motivated by their stronger peers. Stronger students are challenged to move beyond drawing quick solutions to problems and instead strengthen their verbal reasoning skills to become a peer model for weaker students.

***Moving Through Math's*** strong focus on conceptual understanding guides teachers to diagnose gaps in student comprehension. Because formative assessment is continuously driving instruction, teachers can recognize and address these comprehension gaps before progressing to a new content area. Struggling students can quickly transform into exceptional students when their concept gaps are filled. Student learning leads the pace, which helps teachers understand their students better and address their needs.

When students experience ***Moving Through Math***, they learn math concepts visually, aurally, spatially, kinesthetically, verbally, and socially. This allows for a wide degree of differentiation among students, as they experience mathematics through a variety of learning modalities.

**"Having a strong conceptual foundation in patterns really helped my kids understand other equal grouping concepts. I had a challenged student- J.J. - who was taking a make-up test on multiplication. He was getting really frustrated and started just marking answers. I told him to remember how equal groups make up "AB" and "AAB" repeating patterns. He just lit up and re-did his test before time was up--I gave them 5 minutes. He only missed 2 or 3! I was so proud of him! It was the patterns lesson that really connected it for him!"**

## Summary

While all academic programming and curriculum is written to teach the student, the statistics indicate that many are not actually learning with the systems that are currently in place. ***Moving through Math*** educates students effectively and efficiently by teaching through all of the learning modalities. Simply stated, it makes math joyful and relevant.

***Moving Through Math*** lessons deeply connect with students, building a solid foundation of math skills that promote a love for learning. This love of learning will carry over into other academic areas, unconsciously transforming children into active seekers of knowledge. The potential long-range impact of the ***Moving Through Math*** curriculum is heartening. Imagine a classroom where every student is truly being educated -- a real life scenario of 'No child left behind.' The goal of ***Moving Through Math*** is to make this dream a reality. And that reality would forever alter of our educational system, helping it to become what it needs to be -- a facilitator of creativity, collaboration, deep understanding, and growth.

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