Sing; Move; Dramatize; Create Stories, Visuals, and Poems: Learn Math

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Why arts integration?

- Cognitive and social gains
- Ownership and engagement
- Long-term retention

Why is this needed in math?

- Change attitudes
- Address achievement gap
- Lessen re-teaching
- Concretize abstract ideas
- Build mathematical practices

So is it happening?

Unfortunately arts integration is most likely to happen in non-math instruction.

What’s your thinking?

We all have mental images of art and math.

What are some of yours?

<Pictures of quilt, patter block patter, Escher, Geodesic dome, Parthenon>

But…

- Visual arts
- Alignment
- Exemplars

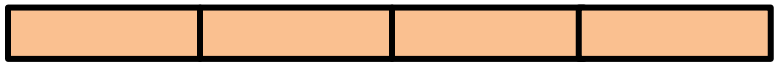
Music

- There are numerous relationships between music and math
- Instruments provide opportunities for experimentation.
- Songs help us remember.

Creating musical meaning

- The arts can provide opportunities to create, rather than apply, understanding.
- Choose a big idea or common partial understanding and explore it through the arts.

Meaning of fractions

Iterate: If  is one-fourth, then four are needed to make one  .

Partition: If  is one, then one of its four equal parts is one-fourth  .

Chant: to whole

Brr

It is so cold

Chant: from whole

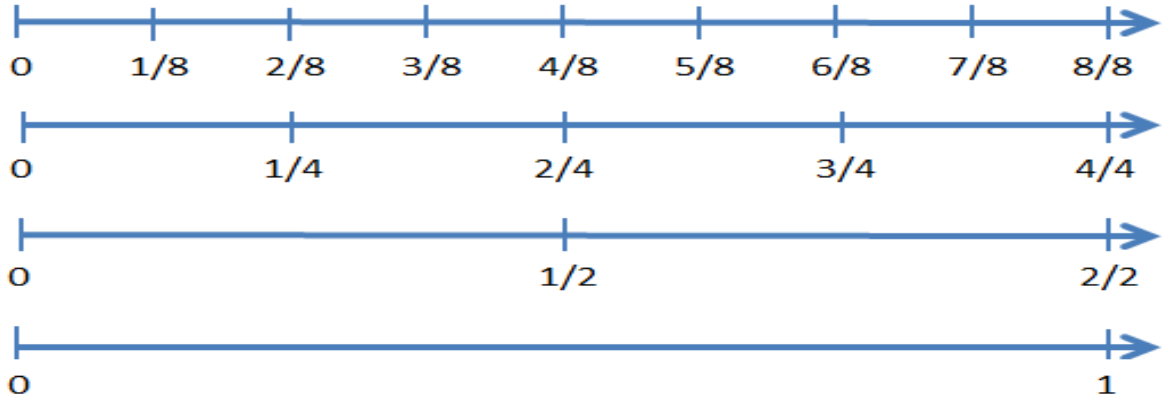
Play

Baseball

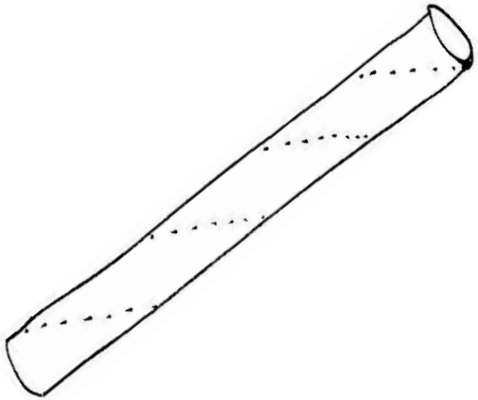
Hit and run fast

Catch high flies and do not drop them

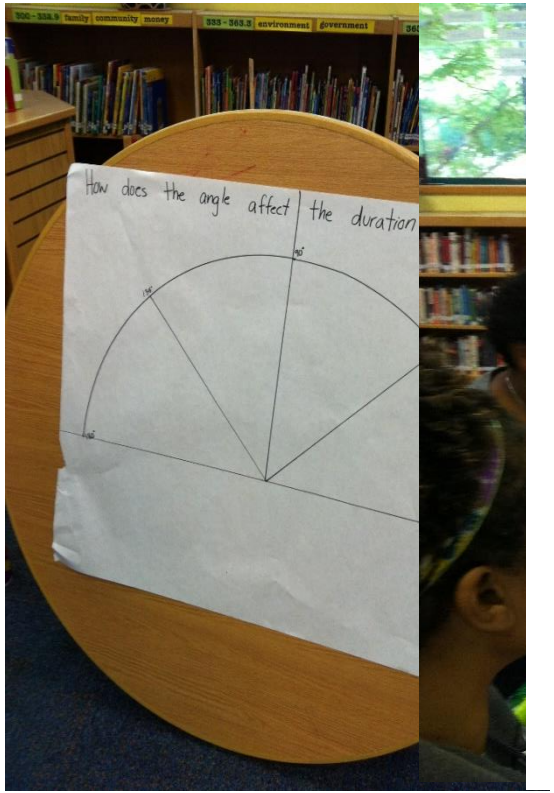
Marking the end of the sounds



Rain Sticks



What experiments to create?



What I predict: One rain stick feels much heavier so assume it has much more filler inside

What I found: When we emptied both rain sticks and measured the ingredients, BOTH rain sticks had exactly the same amount of filler.

So why does one seem much heavier?

One had lentils, rice and black-eyed peas. The other had lentils, rice, black-eyed peas and pinto beans.

We predicted that the pinto beans made it heavier. But when we took just rice and pinto beans and measured a ¼ cup of each and weighted them separately, we found that the rice was much heavier than the beans.

Conclusion: Rice is a denser substance than pinto beans.

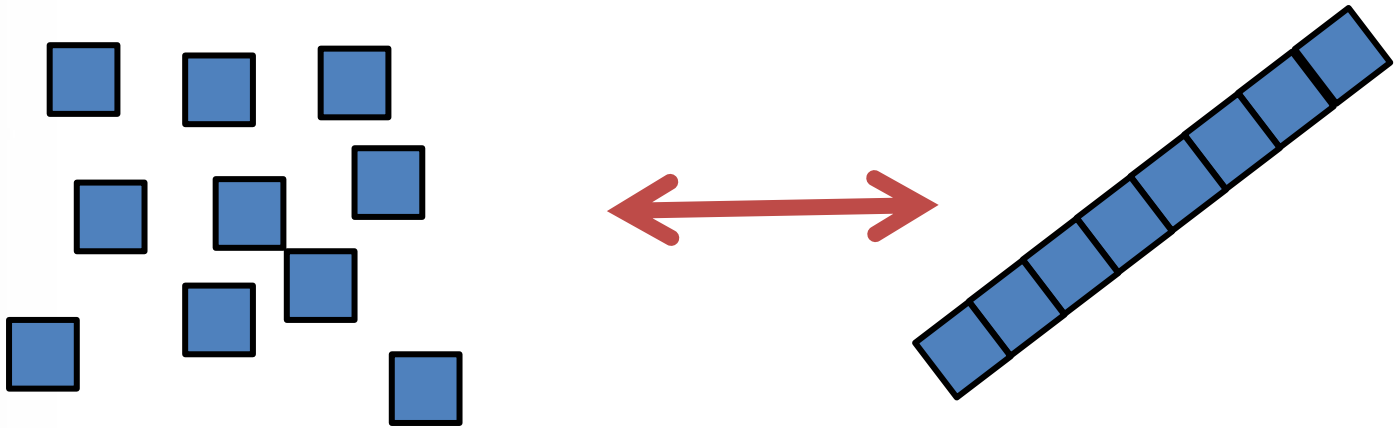
Verse 1
With negative slope
It goes downhill
Like a bank account
After paying bills
Take the change in y
Over the change in x
To find the slope

Verse 2
With positive slope
It goes uphill
Like the water's height
In a glass you fill
Take the change in y
Over the change in x
To find the slope

Creative Movement

- Supports the embodiment of mathematical terms and processes.
- Taps kinesthetic learning and memory.
- Provides a context for the application of mathematical ideas.

Grouping and ungrouping



Separates – not a group

<Picture of kids standing as a non-group>

Forming groups
<Picture of kids standing as a group>

Zigzag practice
<picture of kids practicing moving in zigzags

Huddle of Ten

<kinds move together in zigzag motions until there are ten and they form a “huddle”

Posing questions

What mathematical questions might we ask?

Drama

- Contextualize or decontextualize mathematical ideas.
- Consider alternative perspectives while in role.
- Make choices, clarify thinking, translate concepts, solve problems, and articulate ideas.

Monologues

- Identify a mathematical term or concept as a character.
- Based on the math, what would be his or her strengths? Challenges and worries?
- How might you communicate to the audience about the properties of this idea in a dramatic way?

Enacting Scenes

What do you notice about this conversation?

Collins and Dacey, 2014

Storytelling

- Provide opportunities to explore embedded mathematical ideas.
- Emphasize multiple perspectives or different ways of thinking.
- Present dilemmas that involve listeners in finding solutions.

Untold Stories

- Retelling of classical tales
- Math sidebars that provide information that informs settings, time period, ands characters' dilemmas
- Interactive formats

Hansel and Gretel

Hansel
stooped and
filled the little
pocket of his
coat as full as
it would hold.

The Hunger Games

"The reaping is a good opportunity for the Capitol to keep tabs on the population as well. Twelve- through eighteen-year-olds are herded into roped areas marked off by ages, the oldest in the front, the young ones, like Prim, toward the back."

Interactive story format

Trickster tales

Person in power needs help

Visual Arts

- Can stimulate mathematical questions
- Provide opportunities to apply mathematical knowledge
- Help students to see, process, and represent mathematical ideas.

What math questions might you pose?

Jane and Jack Dawson and Billy Johnson are ready to take back the mantle from after losing last year's snowball escapade match.

It will take 1,000 snowballs a day on March 2rd through 9th to defeat Dr. Evil. Each snowball should weigh 0.5 lbs. At the end of each tunnel there is a giant vault of snowballs to keep the friends stocked. It takes 0.8 of a second to reach these snowballs.

Go Figure It!

Poetry

- Structured poetry to focus on the essence of mathematical ideas
- Rhymes to help students retain information

  video
- Poetry in two voices to compare and contrast ideas.

Dacey, Lynch & Salemi, 2013

Voice 1	*Voice 2*
Negative numbers	**Positive numbers**
Less than zero	More than zero
In the red	In the black
Below sea level	Above sea level
Below freezing	Above freezing
Owe	Earn

We balance each other out
We give symmetry to the number line
Zero is not one of us.

Dacey and Donovan, 2013

Create your own

- Addition and subtraction
- Circles and Spheres
- Linear and Quadratic Functions
- X and y coordinates
- Trigonometric functions

An approach to teaching that allows students to engage in meaning-making, to contextualize and decontextualize mathematics, and to better retain mathematical ideas, all while deepening appreciation for mathematics. *How can you provide students with access to the arts as an engaging way to learn mathematics?*

References

Collins, A., & Dacey, L. (2014). It's all relative: Key ideas and common misconceptions about ratio and proportion, Grades 6-7. Portland, ME: Stenhouse.

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