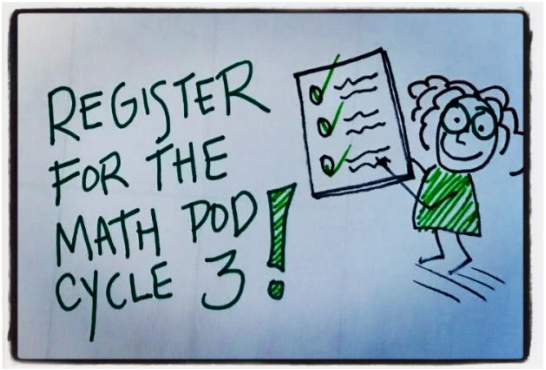
THE MATH POD 2

The Math Pod Cycle 2 with Cathy Fosnot started on January 17th, 2018, and lasted four weeks. It included live broadcasts of Cathy Fosnot's conversations with Stephen Hurley on voicEd Radio. During the shows, Debbie Donsky (SAO[1]) monitored comments and questions Tweeted by the audience. Live broadcasts, organized on Wednesday and Sunday evenings, are available for on-demand listening with other Podcasts.

A couple of days before the live broadcast, the listeners were given a problem on fractions to try it with their classes or on their own. On Sunday nights, another broadcast with Stephen Hurley and different educators—Ve Anusic (SAO), Kathy Prince (SAO), Diamond Elstone, and Ryan Tackaberry—reflected on this work submitted through Twitter.

In January and February, the 499 #MathPod Tweets earned almost 47,000 impressions[2], and had 574 Followers. The radio show had on average 25 listeners and 66 downloads per week. The breakdown of downloads is as follows:

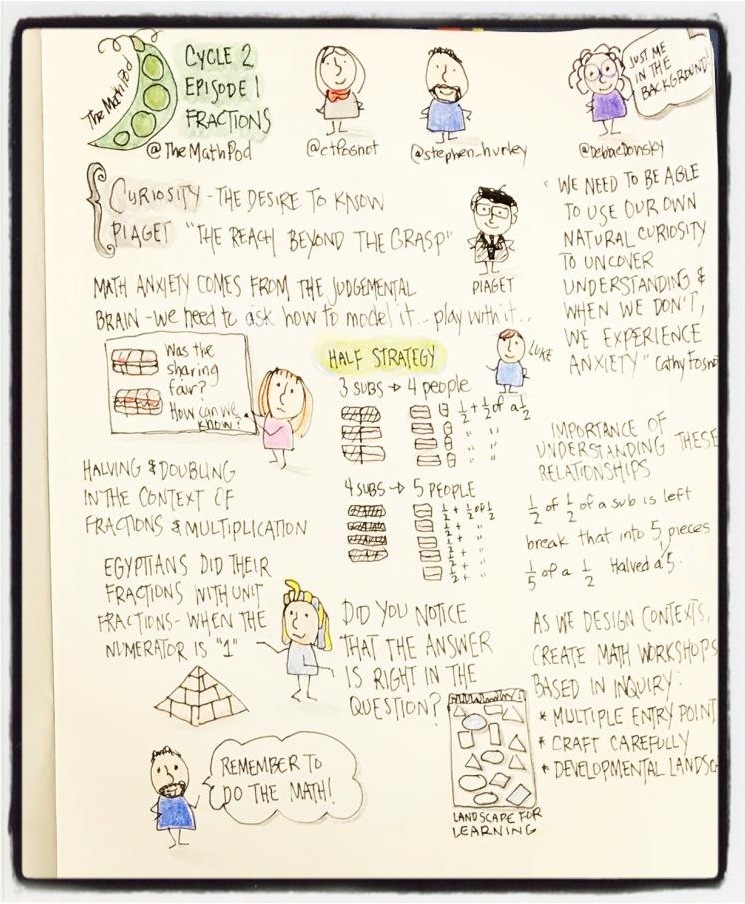
- Episode One—Fractions: The Submarine Sandwich Problem, downloaded by 114
- Teacher Talk 1, Sunday Edition, downloaded by 49
- Episode Two—Best Buys and Ratios: Kitten Food, downloaded by 68
- Teacher Talk 2, Sunday Edition, downloaded by 48
- Episode Three—Playgrounds and Blacktops, downloaded by 60
- Episode Four—The Math Congress and Grounded Practice, downloaded by 55



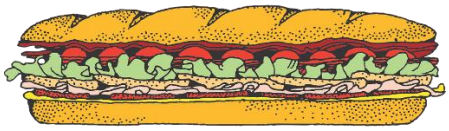
The third cycle of the Math Pod starts on April 4, 2018.

[1] SAO stands for the Student Achievement Officer.
[2] Tweets that generated some interaction from others.

The Submarine Sandwich Problem: Debbie Donsky's depiction of the first episode of the Math Pod 2 and highlights from Stephen Hurley's conversations with Cathy Fosnot



Problem #1: Four groups of children are receiving boxed lunches during a fieldtrip. A group of four kids got three subs to equally share; a group of five kids need to share four subs; a group of eight kids share seven subs; and a group of five kids share three subs. Was the distribution of subs fair among the children?



Big idea: Fractions as division! Fair sharing is a way to introduce fractions to children. With unit fractions (or any set of fractions with common numerators), if a denominator gets bigger, the fraction gets smaller. A fifth is smaller than a fourth, because the fractions are a division!

The whole matters! We need to think what the whole is when we are dealing with fractions.

You represent the student thinking on a model as a way of inducting them into using models as tools for thinking.

Stephen: "Why are fractions so contentions for mathematics teachers?"

Cathy: "Because of the ways they are taught!"

"Mathematicians are driven by a desire to know… When they get stuck, they ask themselves, 'How can I model this?' …Math anxiety often comes when we do not give ourselves permission to model [the problem]."

"We need to allow the children in our classes to be curious, to model the problem, and to work on their own strategies. We need to celebrate their attempts, but also to mentor!... You start with a learner strategy (not a teacher strategy that she got from the textbook)." (Cathy Fosnot)

Best Buys, Ratios, and Rates: Kitten Food: Debbie Donsky's depiction of the second episode of the Math Pod 2 and highlights from Stephen's conversations with Cathy Fosnot

Problem #2: In one store, for $15 you can get 12 cans of cat food. In another store, you can get 20 cans of the same cat food for $23. Which is the better buy?

If the strategy is to split 15 into 12 + 3 and 23 into 20 + 3, it is obvious that in both stores, a can of cat food costs a Dollar and a 'some.' The 'some' in the first store is $3/12 and in the second is $3/20, thus the common whole is $3.

Next, we can pull 3 off—it is the same for both fractions—so we can only compare 1/12 to 1/20. So, now the common whole is 1 and with unit fractions, the greater the denominator is, the smaller the piece is.

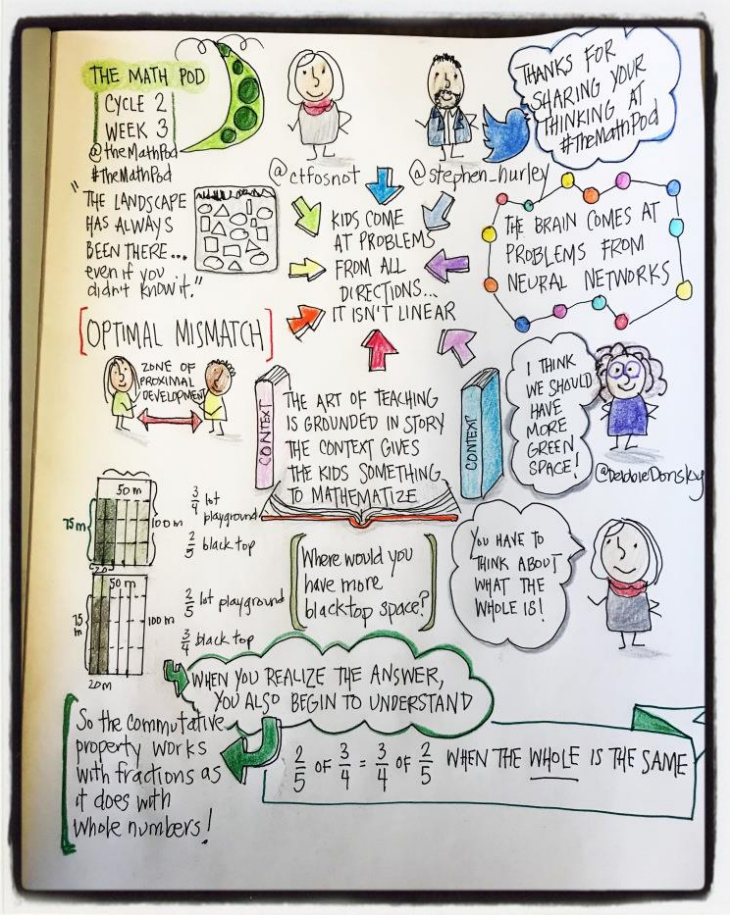
Big idea: For equivalence, the ratio needs to be kept constant.

After this problem, what comes next? We have to build the sequences of problems that are going to generate the topics in math and the strategies and big ideas that we are responsible to teach by the end of the year. Rich tasks are great, but insufficient-sequences are critical! Doing the unit from beginning to end is critical, rather than doing just one problem.

"Context is so important! It does not have to be real, it has to be realizable (i.e., the kids can imagine it). If they stay grounded in the context-they will find the way to do the problem; they won't get lost in abstractions—because it feels real—and the context will help them."

"When you design the problem, you carefully pick numbers (the fact that the difference is 3 in both cases, was carefully thought out) and the fact that there are common factors, common wholes, common multiples, ways to make the numerators common, ways to make denominators common, numbers that are easy enough for kids to grapple with [kids can use money sense to figure out that in the first store they pay a Dollar and a Quarter, an in another they pay one Dollar and three Nickels]." (Cathy Fosnot)

Playgrounds and Blacktops: Debbie Donsky's depiction of the third episode of the Math Pod 2 and highlights from Stephen Hurley's conversations with Cathy Fosnot



Problem #3: Two lots, each 100m x 50m, have architects working on them to design playgrounds for the community. 3/4 of one lot will be a playground, 2/5 of which would be covered by blacktop, while 2/5 of the second lot will be a playground, 3/4 of which will be covered by blacktop. Would both lots be covered by the same amount of blacktop?

Do not worry about dimensions of the lots—they are the same anyways. Just draw two rectangles and divide them according to each scenario.

Fractions are relations. When we do 2/5 of 3/4, then 3/4 is a whole; when we do 3/4 of 2/5, then 2/5 is a whole. The whole matters!

Ask the child, "Which part of your picture is playground?" Use different colours for the playground and the other part of the lot. Help students make pictures of the problem, rather than pictures of the fractions.

Use optimal mismatch when pairing the kids, so that one can understand what it means when the other tries to explain it to him.

The big idea is a commutative property of multiplication of fractions.

"The numeracy is more critical than ever before. Crafting problems carefully is so important. Choosing numbers, envisioning models children can use." (Cathy Fosnot)

"How not to be overwhelmed with all the richness of landscapes?" (Stephen Hurley)

"Instead of thinking of it as a list of things that you are trying to teach (e.g., looking at a graphics in front of you and thinking 'I need to know what each of these things is') …try to get a sense of what this thing is. Look at children's work and try to understand what they are doing…. Learning is messy, and it's messy because it is not linear—students arrive at a problem from all the different sides, and the landscape presents that richness." (Cathy Fosnot)

The Math Congress and Grounded Practice: Cathy Fosnot was joined by Sara Presswood and Kate Sienna (Halton DSB) to discuss the implementation of Cathy's units and resources in their Board

Stephen asked Sara and Kate what are they "seeing as the educators that they are working with go through some of these investigations for the first time?"

- Kate reflected on the importance of using models (e.g., clocks and money). She recalled that teachers are asking, "Which numbers work best with which model?"
- Sara talked how it is important for, "teachers to give themselves permission to dig into the work, to look into the big ideas and how the specific learning expectations can be clustered and grouped together… Taking their time to dig deeper into the math is a big first step for a lot of people…"

> *"Shift to looking at the children and what math they are doing, and the math they are trying to do and what their strategies are, and how to get underneath and lift those strategies, that's a huge shift from the teacher thinking that 'I need to transmit and I need my kids to be listening to me right now, and my job is to explain my thinking.' It's the children that have to own their mathematics."*

> *"A congress is a conscious crafting of conversation around the few big ideas, getting a discussion on them, connecting pieces, or progressively scaffolding conversation. The purpose is to deepen the mathematics of the whole community, it is not just to share. Crafting this conversation, knowing what to go for, is the hardest part for teachers—is one of the big hurdles."*

> *"Assessment is a three-legged stool—it has to be dynamic and it has to be informative. One leg is assessment in the moment, when teacher documents children's pathways along the landscape; another leg is a formative assessment of individual work along investigations (be careful not to confuse literacy with math!) or a two-pen assessment; and the third leg is the DreamBox adaptive engine. All these add to a strong picture to inform one's teaching."*

> *"Stay curious!" (Cathy Fosnot)*

Acknowledgements

We thank all educators who participated in the Math Pod 2. Big thanks to educators who contributed to the podcasts: Ve Anusic, Kathy Prince, Diamond Elstone, Ryan Tackaberry, Sara Presswood, and Kate Sienna.

The MKN is funded by the Ontario Ministry of Education. The MKN is a KNAER Project, hosted by the Fields Institute for Research in Mathematical Sciences. The views expressed in this document, created by Dragana Martinovic and Debbie Donsky for the Mathematics Leadership Community of Practice, belong to the authors and do not necessarily reflect the opinions of the Ministry of Education nor the Ontario government.