

Pennies on the Freeway?!

1 penny
weighs
2.5
grams

1 pound
=
453.5923
grams



40,000
pounds of
pennies?!

Rough Draft Talk

Creating a Safe Classroom Culture
to Engage Students in
Mathematics Classroom Discourse

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NCTM's Innov8 2016 Theme

Engaging the Struggling Learner

NCTM's Innov8 2016 Theme

Engaging the Struggling Learner

Motivating and engaging all learners
(to participate in classroom discussions)



The Penny Spill! A problem in three acts



Act 1: What is the central conflict?

What are your questions?



Act 1: What is the central conflict?

What questions can you ask and answer using mathematics about the picture?



Act 1: What is the central conflict?

Some possible questions....

- How many pennies were spilled?
- How long did it take to clean up the pennies?
- How many pennies were in the truck?
- How much would all of those pennies be worth?
- How many pounds of pennies were spilled?
- How much surface area did the pennies cover?
- What would be an efficient method to count such a large quantity of coins?
- At what angle did the truck hit the barrier?



Act 1: What is the central conflict?

How much would all of those pennies be worth?



Act 1: What is the central conflict?

How much would all of those pennies be worth?

ESTIMATE!

Take a guess...
write it down!



Act 2: Make progress on solving the conflict

How much would all of those pennies be worth?

What information do you need to answer your question?



How much would all of those pennies be worth?



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Mathematical Talk in Acts 1 & 2

What does it look like?

- Brainstorming questions
- Estimating answers
- Imagining what you need to know

How does it feel?

LIKE A ROUGH DRAFT!

- Exploratory!
- Wonderment and curiosity

Important to have an engaging task that supports problem solving (multiple solution paths, personal relevance).

Let's back up...

What is rough draft talk?

Why would we promote rough draft talk in mathematics classrooms?

Rough Draft Talk – What?

Sounds like...

abrupt, bumpy, starts and stops, expressions of uncertainty

Used for...

talk to “work on understanding” (Barnes, 2008)

Any time you’re trying to understand a concept, talking it through can help!

Rough draft talk – Why?

A part of creating a classroom culture where it is safe to *explore*, safe to share ideas in progress

It is helpful to use talking as a tool for thinking

Rough draft talk – Why?

Opportunities to revise thinking supports learning

Mathematics learning involves...

- Expanding our ideas
- Making new connections
- Refining our thinking to become more precise

Rough draft talk – How?

(Have a mathematical task worth talking about...)

Tag the talk as “rough draft”

Discuss with students how people learn and the role of talking in the process of learning

Any time we learn anything new, we might not yet have the words yet. This can feel uncomfortable. But it is helpful to talk about our ideas because talking helps us work on understanding our ideas even more.

Our awkward ways of talking things through when we do not understand (yet) is a sign of productive struggle in action!

Rough draft talk is where the learning happens.

Rough Draft Talk: Supporting our Students

How do students expect to participate during math class?

- Talking out loud during class = performing smartness or avoiding performing less-than-smartness

“I’m kind of really shy, so I’m, like, super conscious about when it comes to answering in front of people. . . . I was, like, always nervous that it would be wrong.”

Rough Draft Talk – Supporting Students

Why do we engage our students in whole class discussions?

To continue their (our) learning!

Share thinking while it is in-progress rather than fully developed.

Be open to revising your thinking.

Contrasts with performing.

If we want students to engage in a particular way... we need to understand what they think they're expected to do, help them understand that we have a different expectation for them, and create a space where it's safe to have risky conversations about thinking.

Rough Draft Talk – Supporting Students

Change what it means to perform smartness

If sharing ideas in progress helps others learn, then sharing rough draft thinking is a way of being smart in math!

- Share your questions
- Share your incomplete thoughts
- Share your ideas about getting started
- Share something you notice that you're not 100% sure about

We can all be inspired by in-progress thinking!

If we open up what it means to be smart in math, more people can own their smartness!

Rough Draft Talk

Create a safe space

For working on understanding by talking

This allows more people to be seen as smart in math

And rough draft talk is productive struggle in action --
where the learning happens!

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Act 3: RESOLUTION

How much would all of those pennies be worth?

Make a new, informed guess.



Act 3: RESOLUTION

How much would all of those pennies be worth?

ROUGH DRAFTS

A round of non-evaluative sharing

Share Rough Drafts: Getting Started

"If I know the amount of grams in a pound and how much a penny weighs in grams, I can find the amount of pennies per pound."

$$453.5 \text{ g} \div 2.5 \text{ g. Penny} = 181.4 \text{ pennies per pound}$$

Share Rough Drafts: Getting Started

"If I know that there were 40,000 pounds of pennies spilled and that there are 453.59 grams in a pound, I can find the amount of grams of pennies that were spilled."

40,000 pounds (of pennies)

453.59 grams in a pound

2.5 grams per penny

$40,000 \times 453.59 \Rightarrow$ total penny's grams

18,143,600 grams in the 40,000 pounds of pennies spilled

Act 3: RESOLUTION

How much would all of those pennies be worth?

REVISE rough drafts to be more illuminating and precise
Second round of sharing

Share Next Drafts: Revision

How many pennies per pound?

$$\hookrightarrow 453.5 \div 2.5 = 181.4$$

grams
per pound

grams
per
penny

pennies
per lb (pound)

How many pennies in 40,000 lbs?

$$\hookrightarrow 181.4 \times 40,000 \text{ lbs} = 7,256,000$$

pennies
per pound or

↓
1 pound of
pennies

pounds of
pennies in
truck

pennies
in the
truck

$$7,256,000 \div 100 = \$72,560$$

Share Next Drafts: Revision

total pounds of pennies
↓

of g in 1 lb.
↙

total weight
↙

of g of pennies in truck
↙

$$\frac{(40000 \times 453.6)}{2.5} = 7,257,600 \text{ pennies in the truck.}$$

↑
total # of pennies

2.5g
↑
g in 1 penny

So \$72,576

Rough Draft Talk: Take Away Ideas

When teachers developed new routines for allowing students to brainstorm, incorporating non-evaluative sharing, and promoting revision of thinking, students' in-progress thinking was positioned as valuable.

Rough Draft Talk: Take Away Ideas

1. Explicitly talk with students. Let them know that talking about ideas while they are still in-progress supports learning (yours and everyone else's!)
2. Explicitly tag discussion moments as “rough draft talk” (familiar to students from Language Arts)
3. Create an exploratory atmosphere (invite students to ask their own questions, brainstorm, estimate)
4. Incorporate rounds of non-evaluative sharing (e.g., how are you getting started?)
5. Promote revision of thinking
6. Position students' in-progress thinking as valuable.



quick reads

a good idea in a small package

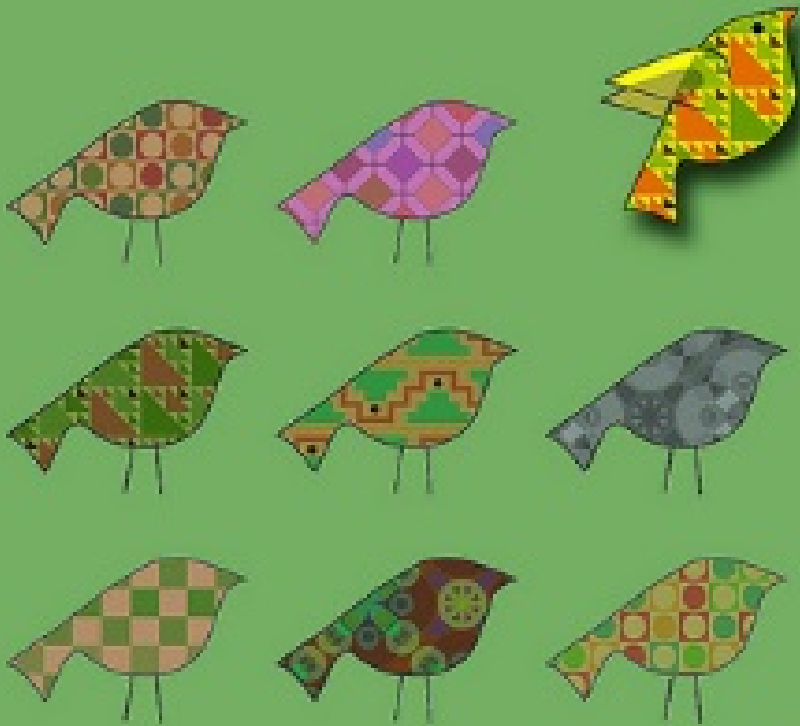
Rough-Draft Talk in Mathematics Classrooms

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MATHEMATICS TEACHING IN THE MIDDLE SCHOOL ● Vol. 22, No. 5, December 2016/January 2017

Motivation Matters and Interest Counts

Fostering Engagement in Mathematics



James A. Middleton
Amanda Jansen

 NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

Chat with Mandy

Thursday, 12:15 – 12:45 p.m.

Book Talk: Amanda Jansen & Jim Middleton
The Book Nook, Exhibit Hall 2

Friday, 10:45 a.m. – 12:00 p.m.

Motivation Innovator: Amanda Jansen
Innov8 Bar, Exhibit Hall 2

Rough Draft Talk Reflection

When it comes to mathematics classroom discussions...

I used to think...

Now I think....

<http://tinyurl.com/RDT-NCTM>