The Language of Mathematical Problem Solving, Reasoning and Fluency
13th December 2018
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2018-19 Project Overview
Developing mathematical language through the three aims.
13 Nov and 13 Dec – Problem Solving
29 Jan, 26 Feb and 2 Apr – Reasoning
25 June – Fluency
nrich.maths.org/towerhamlets2018

Aims
We asked you on Day 1 to reflect on your focus for attending this six-day programme.
Imagine you were feeding back to a colleague, what would you say the aims of Day 1 had been?

Tasks to talk about
Quad Match (6998)
En-Counters (6981)
Stringy Quads (2913)
Which one doesn’t belong?
Quadrilateral Classification
Triangle Classification
Factor Lines (1138)

Reflecting on classroom experiences
• What went well?
• Were there any surprises?
• What would you do differently next time, or what additional guidance would you give to a colleague?

New live tasks
Triangle or No Triangle (14041)
Name That Triangle! (14042)
The Problem-solving Process

Stage 1: Getting started
Stage 2: Working on the problem
Stage 3: Digging deeper
Stage 4: Concluding

Stage 1: Getting Started
try a simpler case
draw a diagram
represent with a model
act it out

One Big Triangle (192)

Stage 2: Working on the Problem

Two-digit Targets (6343)

You have a set of digits from 0-9.
Can you arrange these digits into the boxes to make five two-digit numbers as close to the targets as possible? You may use each digit once only.
Stage 2: Working on the Problem
- look for a pattern
- work backwards
- reason logically
- conjecture
- work systematically
- visualise
- trial and improvement

Stage 3: Digging deeper
- generalise
- verify
- prove

6 Beads (152)
If you put three beads onto a tens/units abacus you could make the numbers 3, 30, 13 or 21.

Stage 3: Digging deeper
- generalise
- verify
- prove

Stage 4: Concluding

How Would We Count? (8123)
New EYFS resources

- Subitising article (14004)
- Two new activities:
  - Hidden Jewels (14002)
  - Number Talks (14005)

Stage 4: Concluding

Communicate findings
Evaluate

Problem-solving Process

1. Getting started
   - Try a simpler case
   - Draw a diagram
   - Represent with model
   - Act it out

2. Working on the problem
   - Work backwards
   - Reason logically
   - Conjecture
   - Work systematically
   - Look for a pattern
   - Visualise
   - Trial and improvement

3. Digging deeper
   - Generalise
   - Verify
   - Prove

4. Concluding
   - Communicate findings
   - Evaluate

Which Scripts? (774)

There are six numbers written in five different scripts.
Can you decipher the scripts?
What are the six numbers?

Problem-solving skills

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<tr>
<th></th>
<th>EYFS</th>
<th>KS1</th>
<th>KS2</th>
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</thead>
<tbody>
<tr>
<td>Try and improve</td>
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<td>Working systematically</td>
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<td>Pattern spotting</td>
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<td>Spatial reasoning</td>
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<td>Visualising</td>
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<td>Working backwards</td>
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<td>Communicating</td>
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Tasks to talk about

- Quad Match (6998)
- En-Counters (6981)
- Stringy Quads (2913)
- Factor Lines (1138)
- Triangle Classification
- One Big Triangle (192)
- Two-digit Targets (6343)
- 6 Beads (152)
- Which Scripts? (774)
- How would we count? (8123)

Which one doesn’t belong?
Quadrilateral Classification
**Reading reflection**

Using NRICH tasks to develop key problem-solving skills

(11082)

Developing good team-working skills

(8277)

**Common themes from your input:**

- Embedding mathematical talk into classroom practice
- Developing opportunities for all children to reason mathematically
- Differentiation with a difference
- Nurturing children’s confidence (in the context of mathematics and/or more generally)
- Teaching problem solving skills
- Embedding problem solving, reasoning and fluency into every day practice
- Nurturing children to be independent learners and thinkers
- Sharing of good practice (with immediate colleagues, school-wide and beyond)
- Considering language when assessing

**Transforming Primary Mathematics by Mike Askew**

*Talk that supports collective mathematical activity is characterised by:*

- Emphasising listening as well as speaking
- Recognising the difference between discussion and dialogue
- Focusing on mathematical reasoning as much as answers

**“Conferring in a math workshop is not about helping learners to get a correct answer to the problem in hand... it is about supporting the development of a young mathematician to become a better, more competent mathematician.”**

from ‘Conferring with young mathematicians at work’ by Cathy Fosnot

**“I was less curious in understanding my students’ ideas than I was in the attractive sheen of correctness”**

Dan Meyer
26.07.18
blog.mrmeyer.com

**Thank you game**

Challenges and opportunities
Totality (1216)

Low Threshold High Ceiling
- Suitable for whole range
- Low entry point
- Lots of choices in
  - method
  - response
  - recording
- Learners can show what they can do, not what they can’t
- High ‘finish’ possible

Possible Pieces (13832)

Rich tasks
- Can have a relatively closed start but offer the opportunity for different responses and different approaches
- Invite questions to be asked
- Combine fluency and reasoning
- Reveal/provoke generalisations
- Encourage collaboration and discussion
- Are intriguing!
- May be accessible to all (LTHC)

Reflection
- What’s the same?
- What’s different?
- Classroom practice implications?

Suggested plan for dissemination

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<thead>
<tr>
<th>Day</th>
<th>Activity</th>
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<tbody>
<tr>
<td>1</td>
<td>Your own class</td>
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<tr>
<td>2</td>
<td>Your own class + 1 other</td>
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<tr>
<td>3</td>
<td>Colleagues (staff meeting)</td>
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<tr>
<td>(and before Day 5)</td>
<td>input + feedback/reflections</td>
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<td>5</td>
<td>TBC for feedback on Day 6</td>
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Don't forget to share published solutions from NRICH site with your children.

Why not submit your children's solutions to our live tasks?
Teacher Takeaway

- Try a task from today in your setting, invite a colleague to do so too and then talk about the outcomes. (and come to Day 3 prepared to discuss)
- Read NRICH articles (11082) & (8277)

References


Dan Meyer
blog.mrmeyer.com