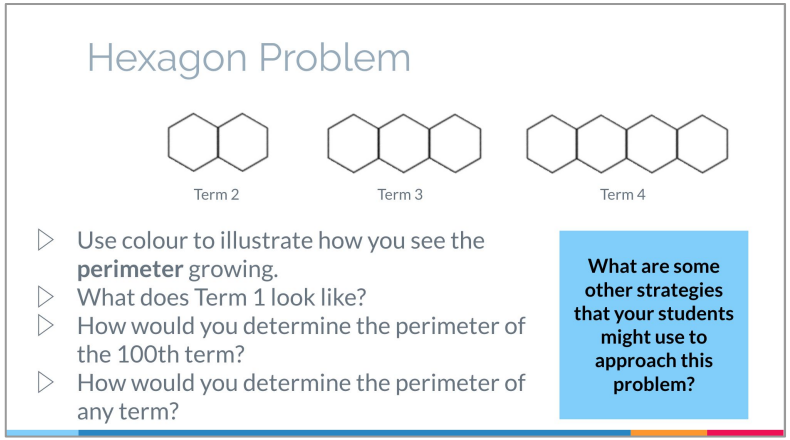
A Professional Learning Model to Build Cross-Grade Mathematics Learning Communities



Hey look! There's a math problem on your table… You should give it a try!

Resource Folder
https://goo.gl/n3t6CE

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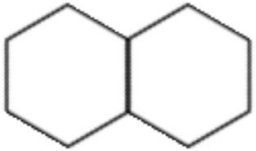
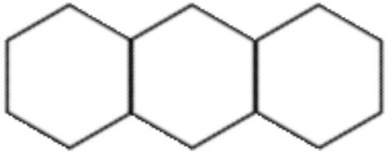
Hexagon Problem

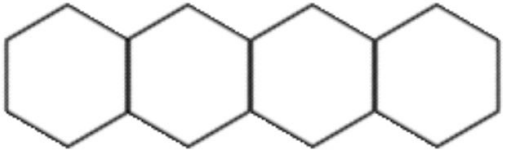
Grades 6 - 8



Term 2



Term 3



Term 4

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Tasked with designing a professional learning experience that would address transitions in Mathematics

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What we know...

Secondary claims too many gaps are created in Elementary

Elementary claims Secondary teaches only traditionally

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What we know...

Elementary does too much show and tell and not enough math harvesting

Secondary does too much math telling and not enough show and tell

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What we know...

These 2 panels never communicate

Students are expected to transition smoothly

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PD Model - Objectives

1. Build cross-divisional relationships

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Build Cross Divisional Relationships

K - 6 Feeder School → **7/8 Feeder School** → **Secondary School**

Grade 6 Team

- 2 Grade 6 Teachers
- 1 Special Education Resource Teacher
- Admin

Grade 7/8 Team

- 1 Grade 7 Teacher
- 1 Grade 8 Teacher
- 1 Special Education Resource Teacher
- Admin

Grade 9 Team

- 2 Grade 9 Academic Teachers
- 1 Special Education Resource Teacher
- Admin

PD Model - Objectives

1. Build cross-divisional relationships
2. Understand the cognitive development of the algebraic progression
3. Clear understanding of grade level expectations and how they are built on in previous/future years

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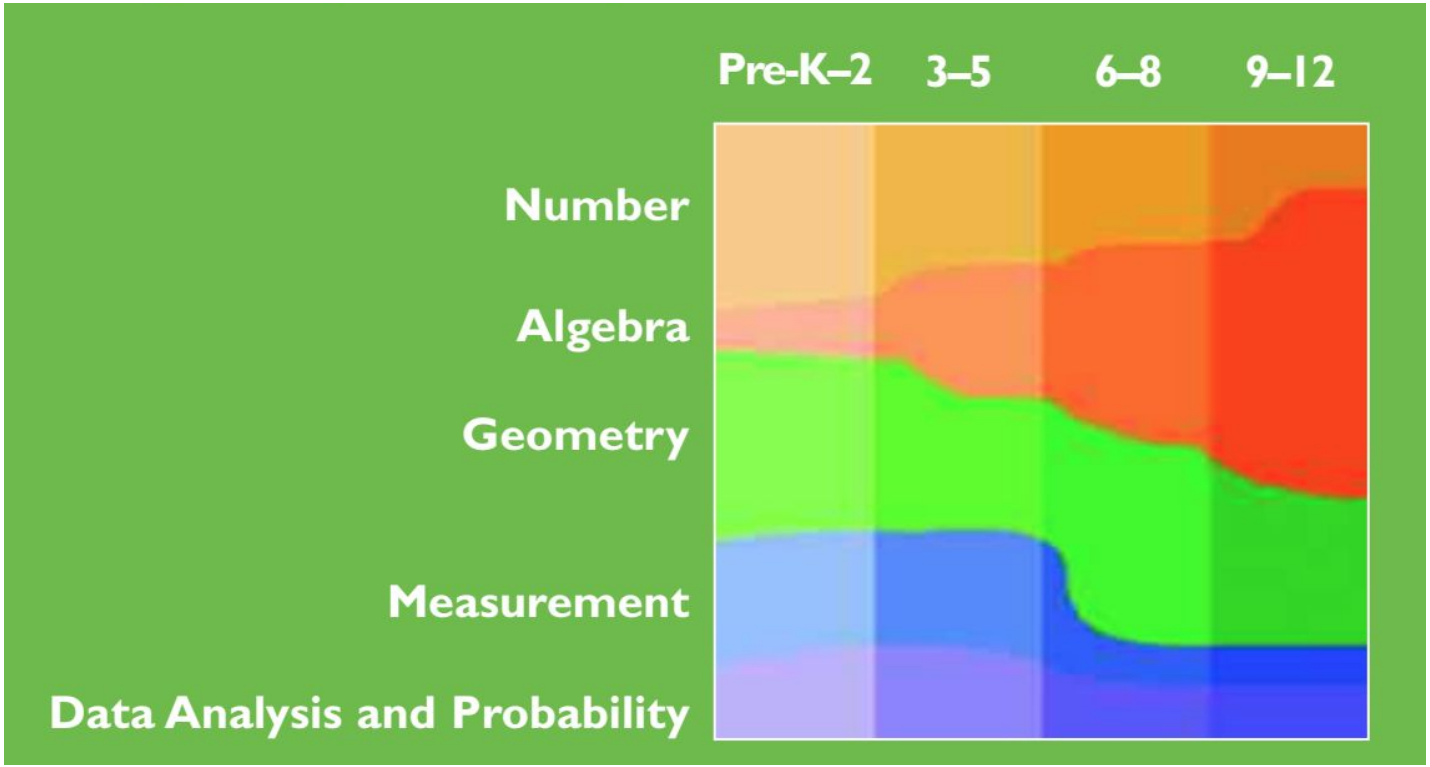
Model - Why Algebraic Reasoning?



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"The 12-year-old who enters Grade 7 is a baby, mathematically speaking. But that same person four years later, upon entering Grade 11, is expected to be acquainted with many of the most important mathematical ideas that exist."

~ *The Importance of Transition Years, Grades 7-10, in School Mathematics.* Usikin, The University of Chicago School Mathematics Project, 2004.

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Recursive / Functional Thinking

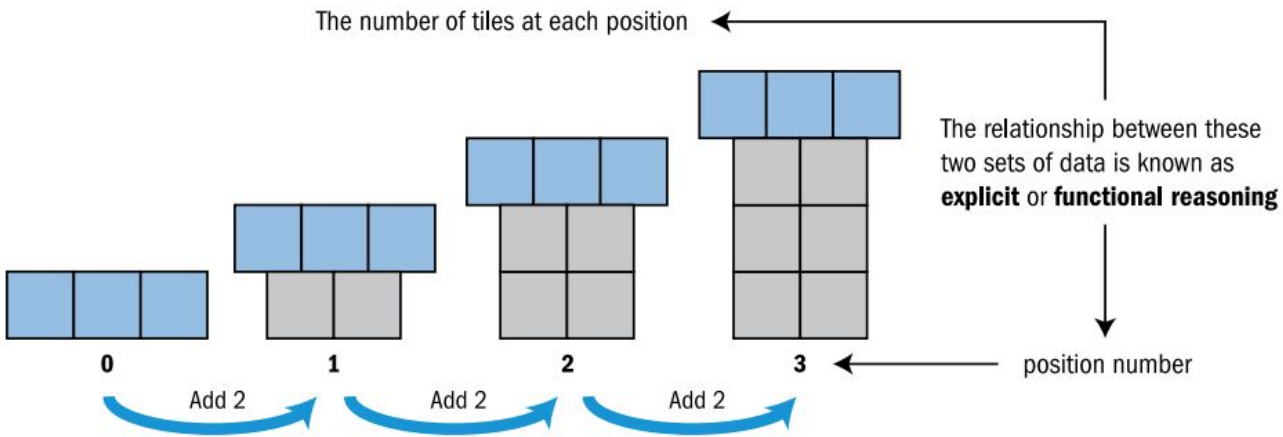
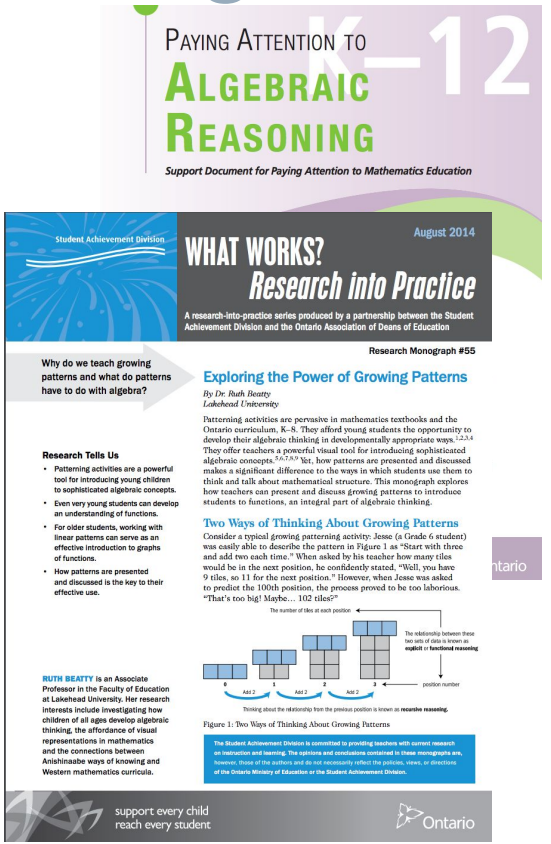


Figure 1: Two Ways of Thinking About Growing Patterns



PD Model - Objectives

1. Build cross-divisional relationships
2. Understand the cognitive development of the algebraic progression
3. Clear understanding of grade level expectations and how they are built on in previous/future years
4. Differentiated Instruction - how one question can be used to address a variety of different learning needs

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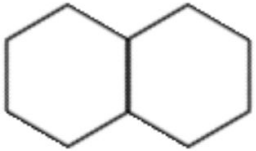
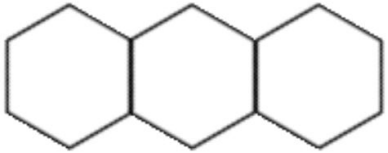
Hexagon Problem

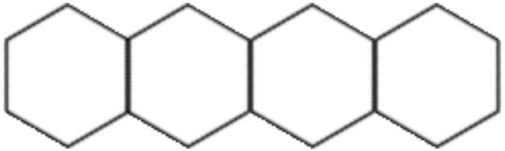
Grades 6 - 8



Term 2

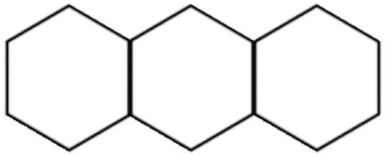


Term 3

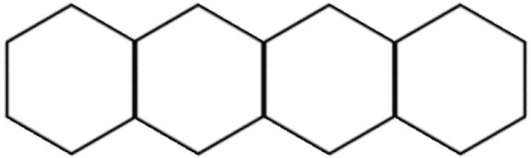


Term 4

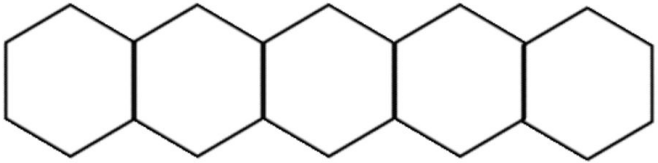
Grade 9 Academic



Term 1



Term 2



Term 3

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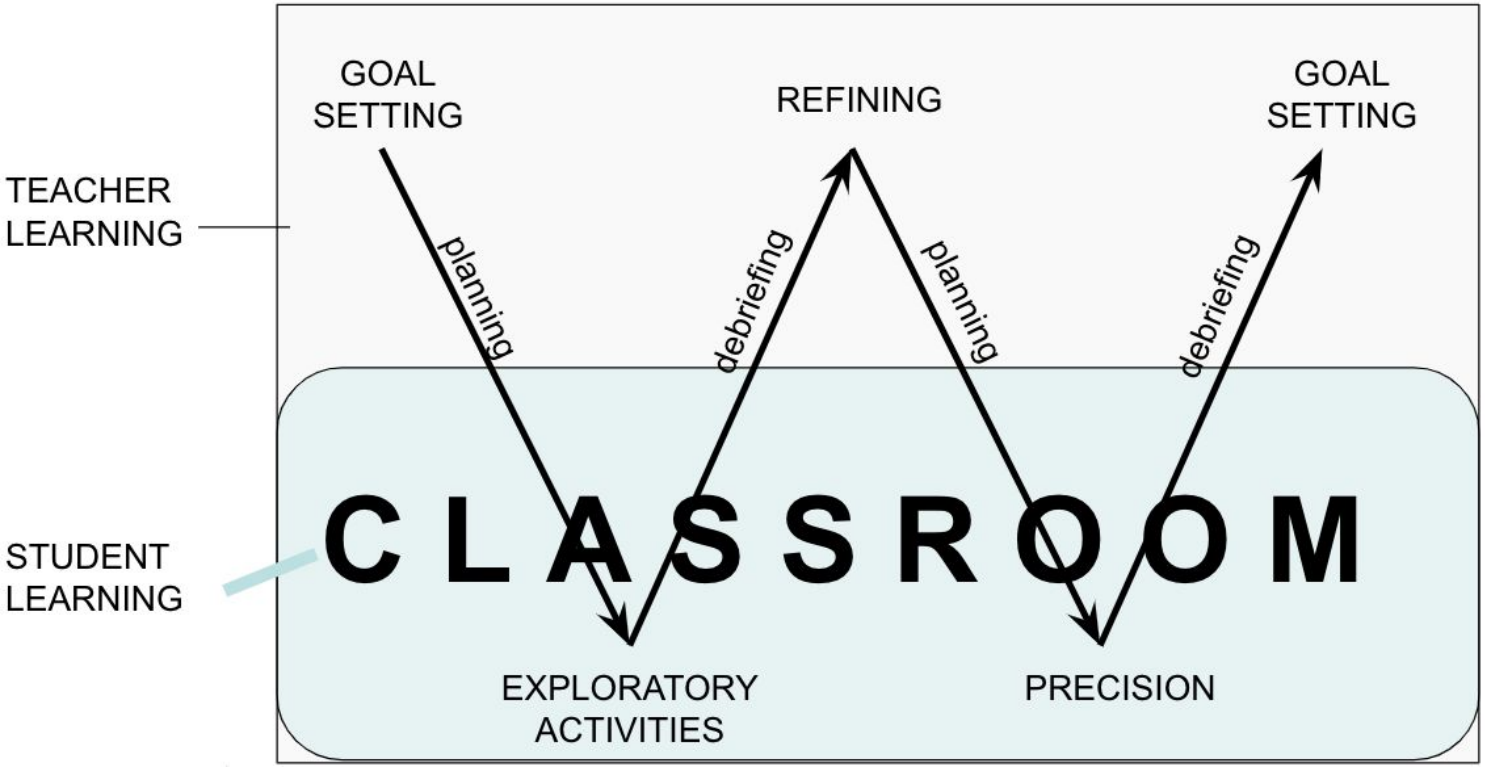
W Model - Cathy Bruce



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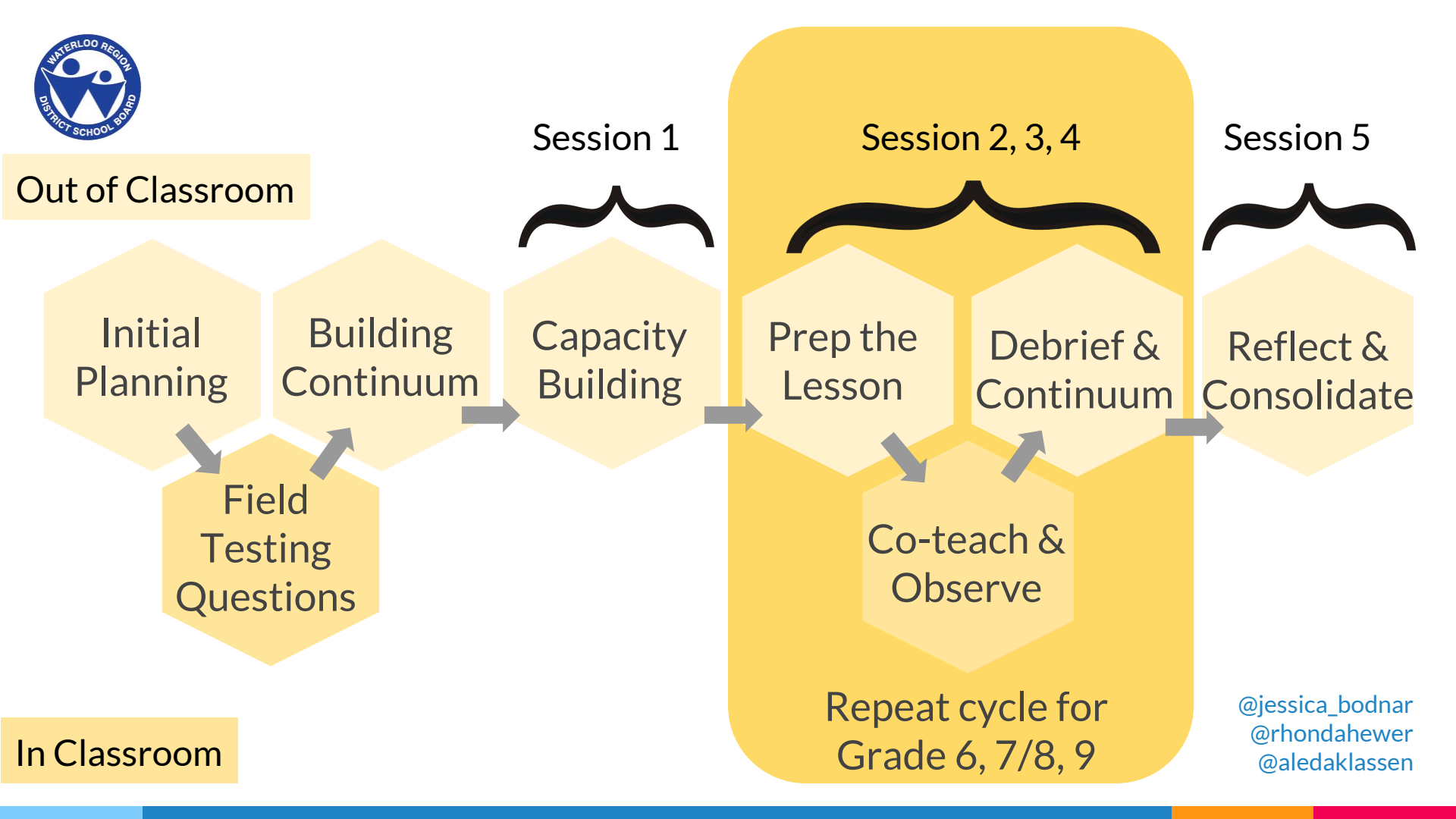
Out of Classroom
Session 1
Session 2, 3, 4
Session 5
Initial Planning
Building Continuum
Field Testing Questions
Capacity Building
Prep the Lesson
Debrief & Continuum
Co-teach & Observe
Reflect & Consolidate
Repeat cycle for Grade 6, 7/8, 9
In Classroom
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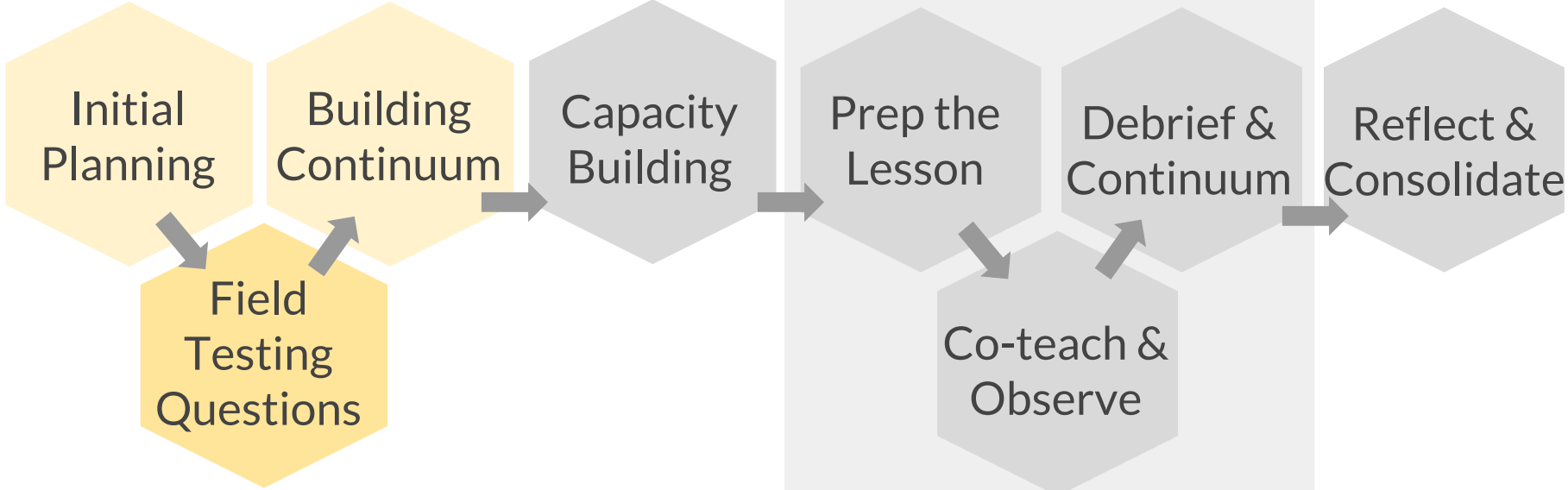
Out of Classroom



In Classroom

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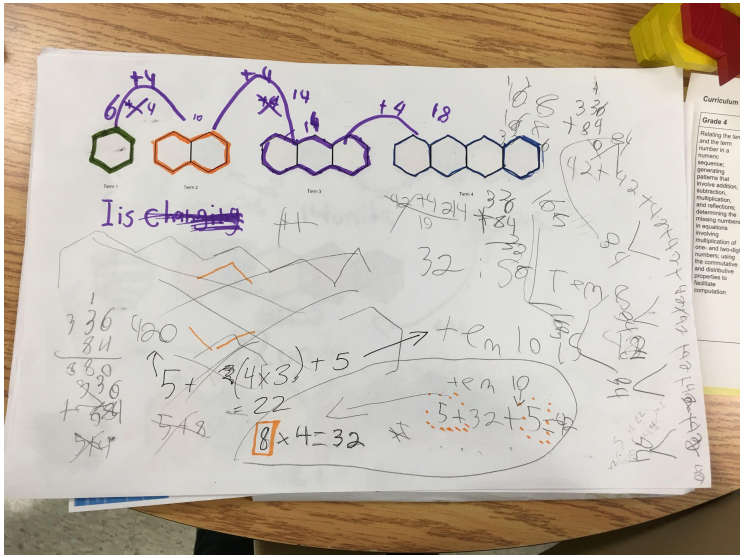
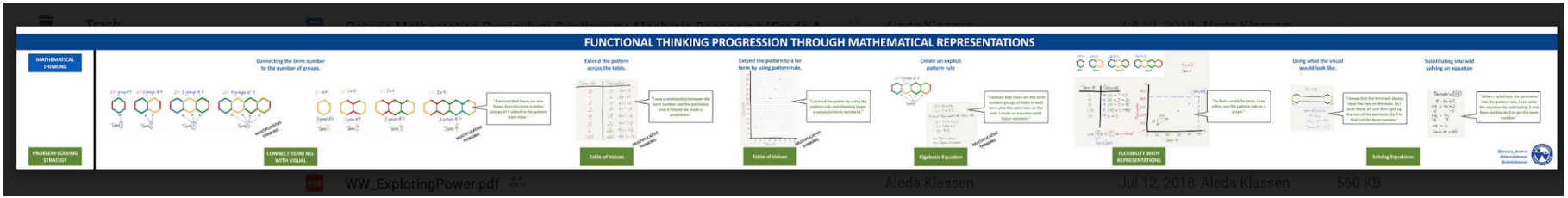
Planning

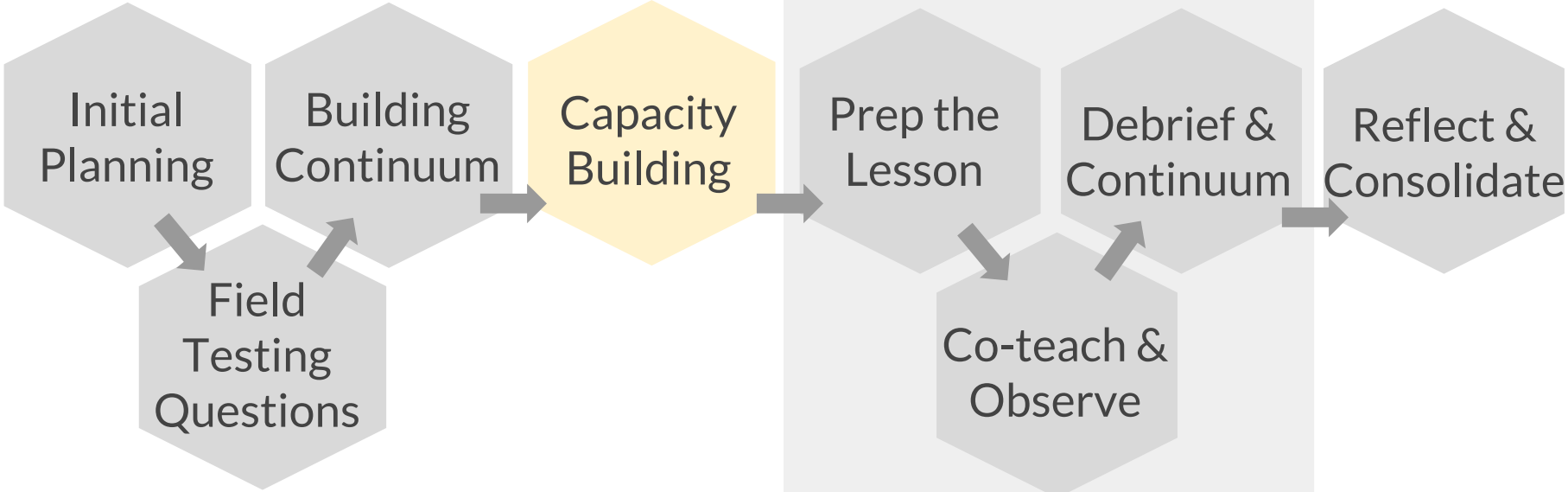


- Field tested questions
- Connected with teachers and answered Q's
- Built Continuum



WW_ExploringPower.pdf Aleda Klassen Jul 12, 2018 Aleda Klassen 560 KB

Out of Classroom



In Classroom

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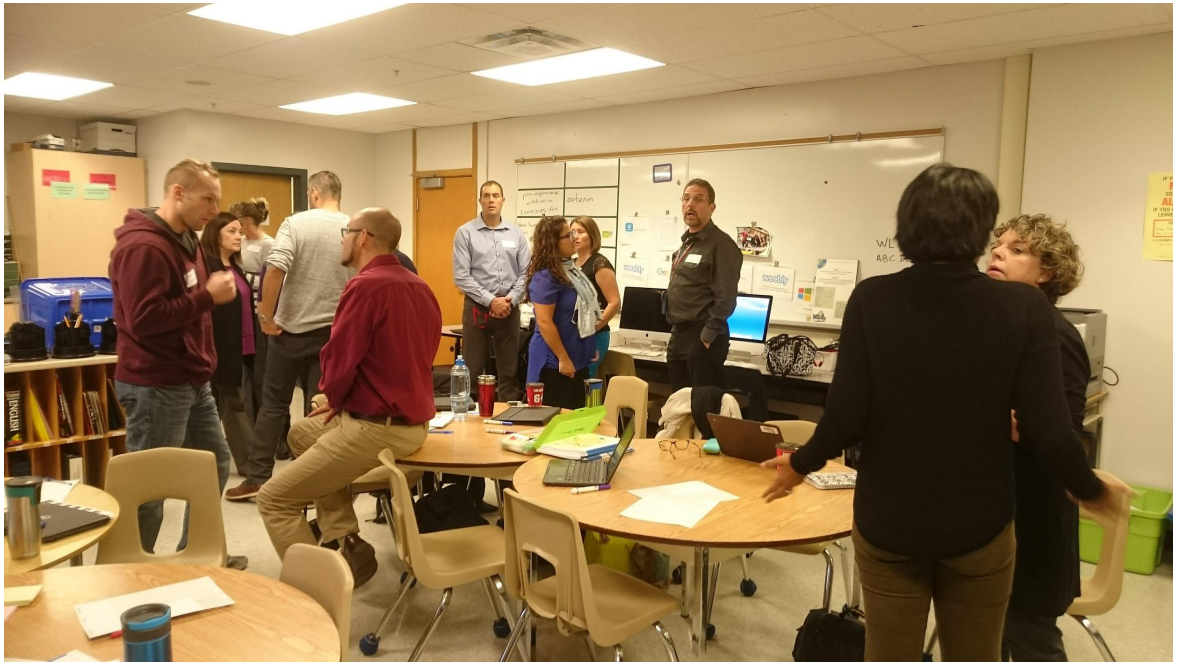
Capacity Building



- Build community
- Do the problem
- Dig into the math
- Explore the continuum
- Logistics

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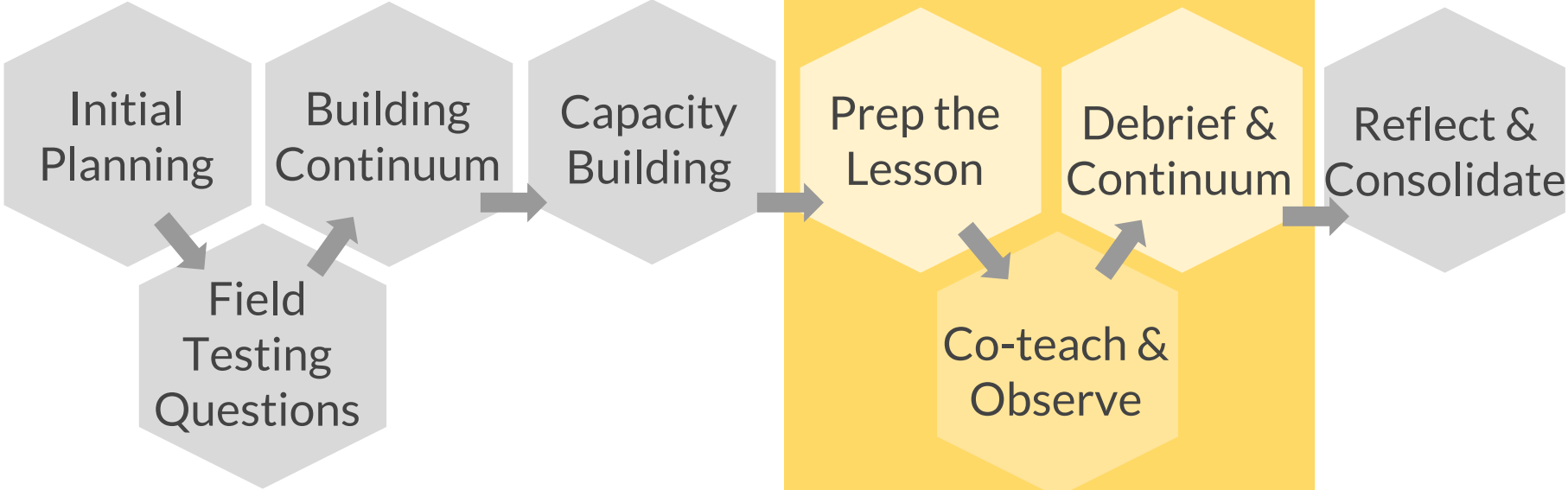
Out of Classroom



In Classroom

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PD Model - Objectives

1. Build cross-divisional relationships
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3. Clear understanding of grade level expectations and how they are built on in previous/future years
4. Differentiated Instruction - how one question can be used to address a variety of different learning needs
5. We all own these students

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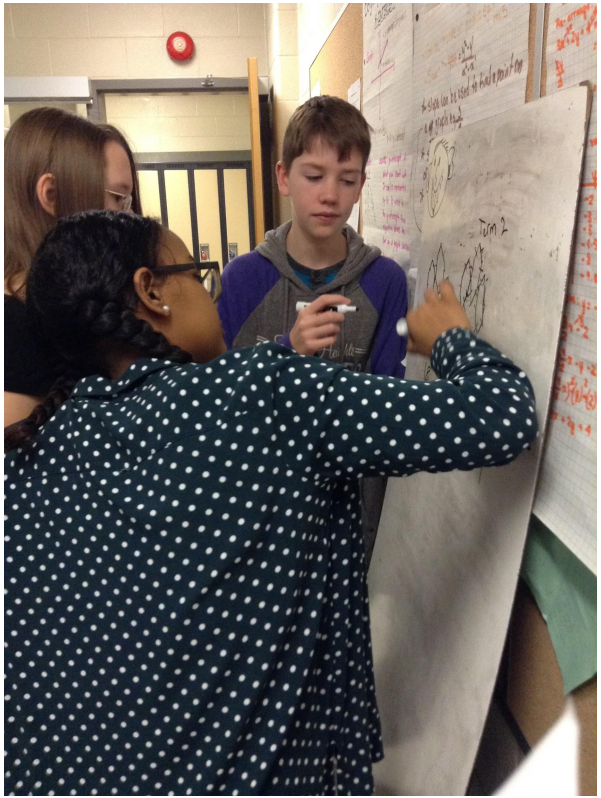
Who are we going in to meet?



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PD Model - Objectives

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4. Differentiated Instruction - how one question can be used to address a variety of different learning needs
5. We all own these students
6. Exposure to pedagogical strategies

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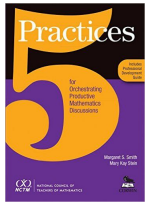
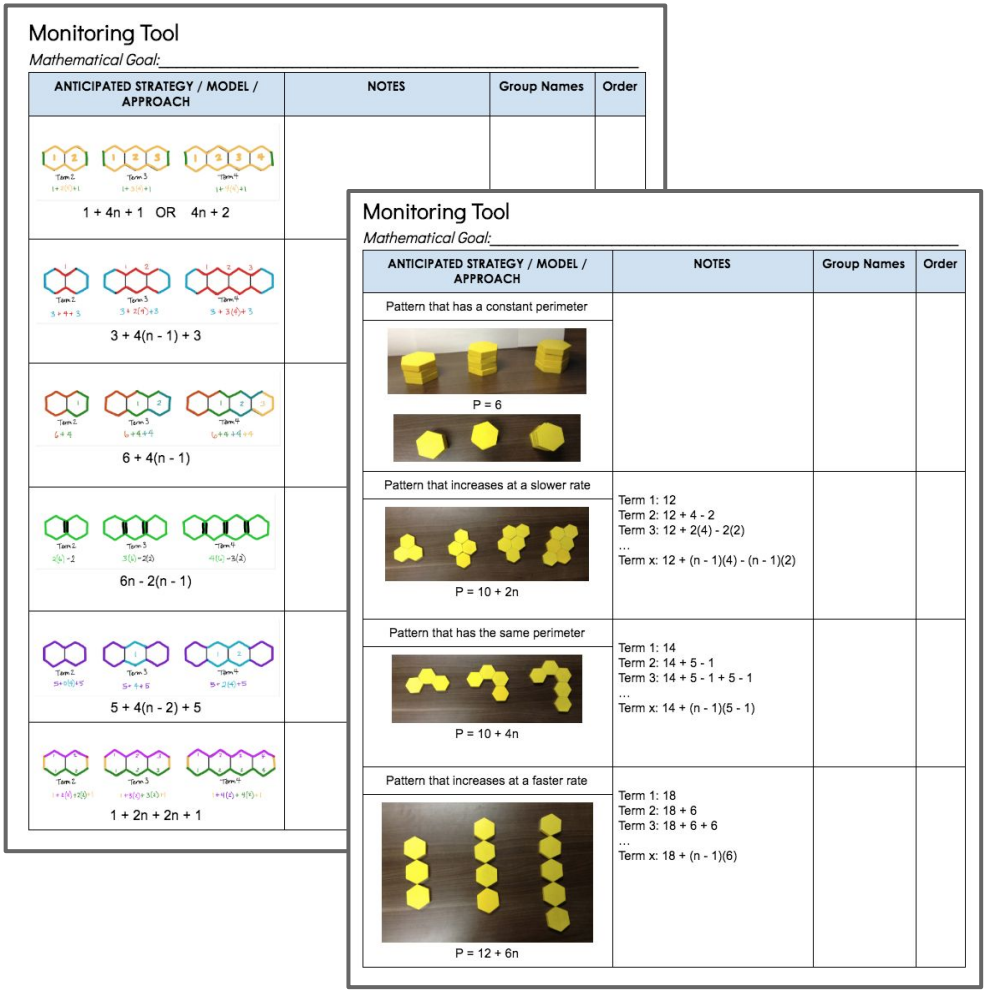
5 Practices

1. **Anticipating**
2. **Monitoring**
3. Selecting
4. Sequencing
5. Connecting





Monitoring Tool

Mathematical Goal:

ANTICIPATED STRATEGY / MODEL / APPROACH	NOTES	Group Names	Order
1 + 4n + 1 OR 4n + 2			
3 + 4(n - 1) + 3			
6 + 4(n - 1)			
6n - 2(n - 1)			
5 + 4(n - 2) + 5			
1 + 2n + 2n + 1			

Monitoring Tool

Mathematical Goal:

ANTICIPATED STRATEGY / MODEL / APPROACH	NOTES	Group Names	Order
Pattern that has a constant perimeter P = 6			
Pattern that increases at a slower rate P = 10 + 2n	Term 1: 12 Term 2: 12 + 4 - 2 Term 3: 12 + 2(4) - 2(2) … Term x: 12 + (n - 1)(4) - (n - 1)(2)		
Pattern that has the same perimeter P = 10 + 4n	Term 1: 14 Term 2: 14 + 5 - 1 Term 3: 14 + 5 - 1 + 5 - 1 … Term x: 14 + (n - 1)(5 - 1)		
Pattern that increases at a faster rate P = 12 + 6n	Term 1: 18 Term 2: 18 + 6 Term 3: 18 + 6 + 6 … Term x: 18 + (n - 1)(6)		

0: Selecting Goals and Task

What is the mathematical goal for the students in your class?

By the end of the this activity my students will know and understand…

Does there need to be any changes to the prompts?

- Use colour to illustrate how you see the **perimeter** growing.
- What does Term 1 look like?
- How would you determine the perimeter of the 100th term?
- How would you determine the perimeter of any term?

1: Anticipating

Which solutions/strategies do you anticipate your students using?

Are there any common misconceptions you anticipate?

Which strategies/solutions will be the most useful in addressing the mathematics goal?

2: Monitoring

Role 1:

- Host Teacher
- Co-Teacher = Consultant
- Introduce lesson
- Ask students questions to guide their thinking
- Provide hints and extensions
- Participate in Consolidation huddle
- Consolidate learning

Role 2:

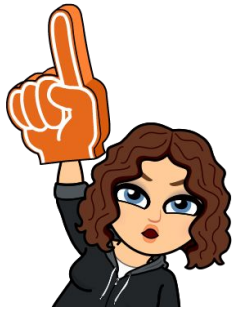
- Classroom Teachers
- Use Monitor Tracking sheet
- Cruise the room and observe different groups
- Select groups and pieces of work for consolidation of the mathematical goal
- Say nothing to guide students
- Participate in consolidation huddle

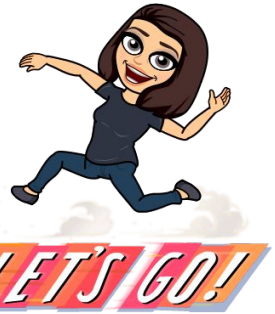
Role 3:

- SERTs, Admin, Itinerant Teacher, LS staff
- Observe one group of students for the entire period
- Document student thinking
- Say nothing to guide students
- One person needs to be a timer
  - 35 minutes – Intro and task
  - 5 minutes – consolidation huddle
  - 20 minutes - consolidation

Preparing for Game Time

- How will you **introduce** the problem?
  Activate prior knowledge (without telling them what to do).
- How will you **check** for understanding of what the task is asking?
- How will students be **grouped**?
  Which groups will have an adult sitting with them?
- What **tools/manipulatives** will be useful to have available?
- What will students **work on**?
  (VNPS, chart paper, 11x17 paper, mini-whiteboards etc.)
- Any **other items** that need to be prepared?





Co-teaching

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Consolidation Huddle (5 minutes)

3: Selecting

- Was there a common misconception that needs to be addressed?
- Which student work will you use?
- Which parts of the student work?
- Purposefully choose work that will advance mathematical thinking

4: Sequencing

- Which student(s) will speak?
- In what order will student work be presented?
- How will work be shared?

Debrief

ORDER

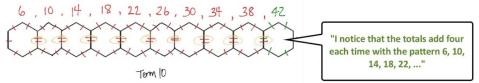
- **Role 1:**
  - Teacher
  - Co-Teacher (Consultant)
- **Role 2:**
  - Classroom Teachers
- **Role 3:**
  - SERTs, Admin, Itinerant Teachers

Lesson/Student Thinking Reflection

- What worked well overall?
- What was challenging overall?
- What were some examples of student thinking that confirmed your thinking or surprised you?
- What are possible next steps for the host teacher?
- What would you change about the task for your students?
- What would you change about the structure of the lesson for your students?

RECURSIVE THINKING

Extend the pattern:
skip counting



Number Pattern

Extend the pattern:
repeated addition

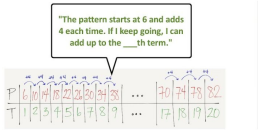


Table of Values

FUNCTIONAL THINKING

Extend the pattern
across the table.

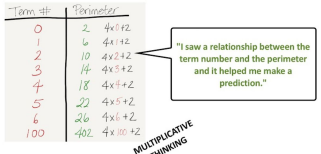
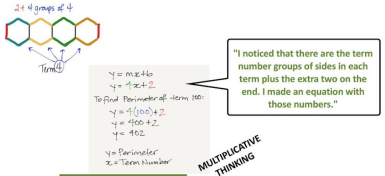


Table of Values

Create an explicit
pattern rule



Algebraic Equation

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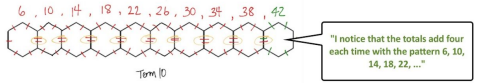
RECURSIVE THINKING

Extend the pattern:
skip counting



Number Pattern

Extend the pattern:
repeated addition

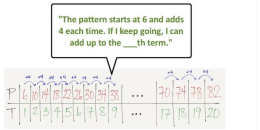


Table of Values

FUNCTIONAL THINKING

Extend the pattern
across the table.

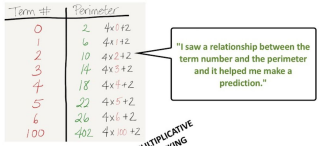
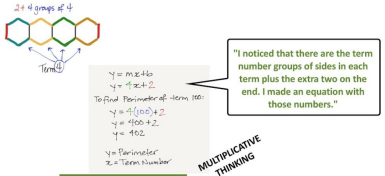


Table of Values

Create an explicit
pattern rule



Algebraic Equation

Where would you place the student work along the continuum?

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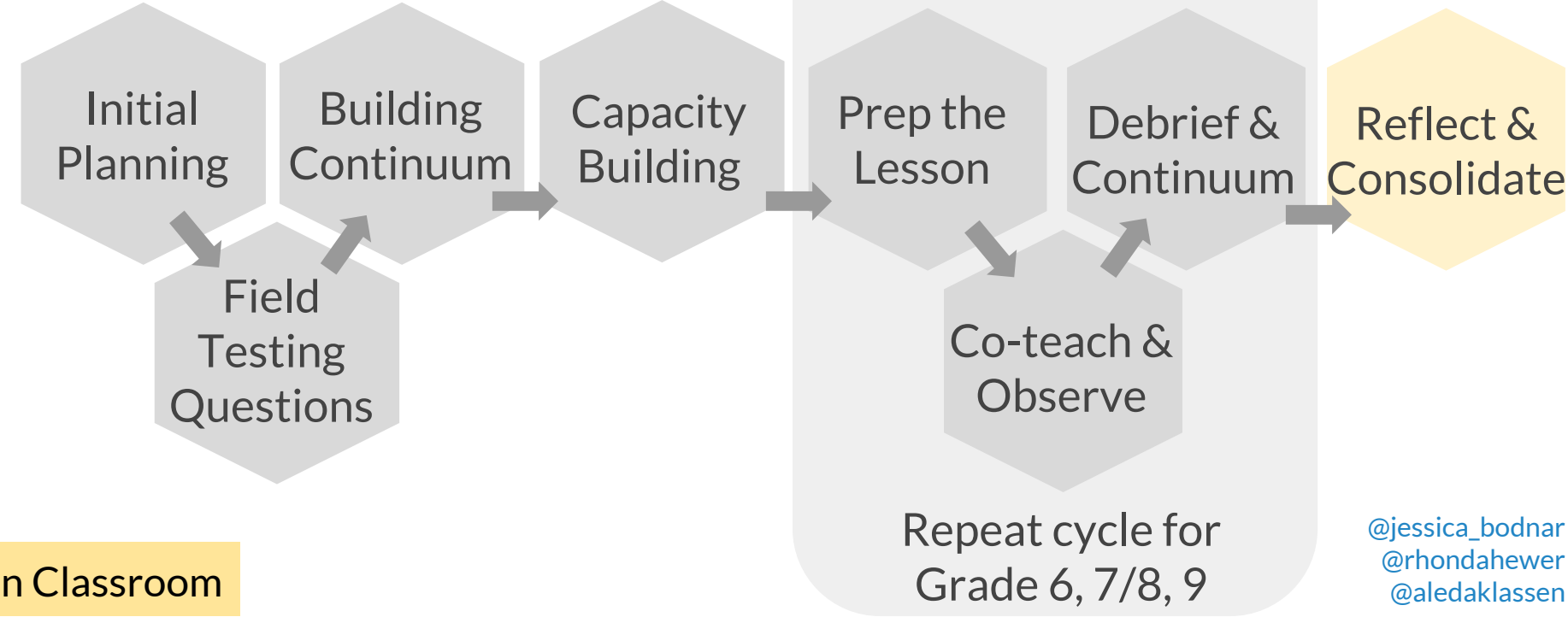
Out of Classroom



In Classroom

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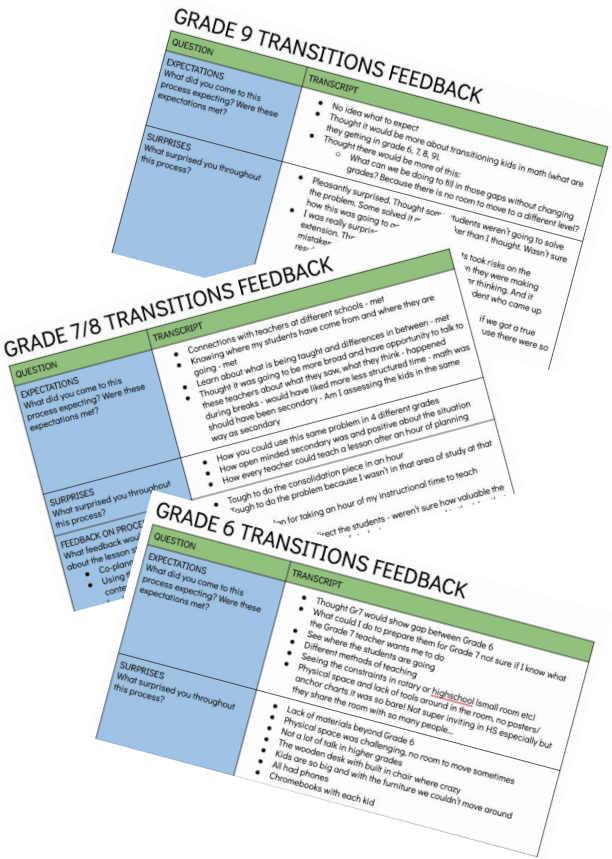
Reflect and Consolidate



GRADE 9 TRANSITIONS FEEDBACK

QUESTION	TRANSCRIPT
EXPECTATIONS What did you come to this process expecting? Were these expectations met?	• No idea what to expect • Thought it would be more about transitioning kids in math (what are they getting in grade 6, 7, 8, 9) • Thought there would be more of this: ○ What can we be doing to fill in those gaps without changing grades? Because there is no room to move to a different level?
SURPRISES What surprised you throughout this process?	• Pleasantly surprised. Thought some... the problem. Some solved it ... how this was going to ... I was really surpris... extension. Th... mistake... res...

GRADE 7/8 TRANSITIONS FEEDBACK

QUESTION	TRANSCRIPT
EXPECTATIONS What did you come to this process expecting? Were these expectations met?	• Connections with teachers at different schools - met • Knowing where my students have come from and where they are going - met • Learn about what is being taught and differences in between - met • Thought it was going to be more broad and have opportunity to talk to these teachers about what they saw, what they think - happened • Thought it was going to be more about what they think - happened during breaks - would have liked more less structured time - math was should have been secondary - Am I assessing the kids in the same way as secondary
SURPRISES What surprised you throughout this process?	• How you could use this same problem in 4 different grades • How open minded secondary was and positive about the situation • How every teacher could teach a lesson after an hour of planning
FEEDBACK ON PROCE... What feedback wou... about the lesson ...	• Tough to do the consolidation piece in an hour • Tough to do the problem because I wasn't in that area of study at that ...

GRADE 6 TRANSITIONS FEEDBACK

QUESTION	TRANSCRIPT
EXPECTATIONS What did you come to this process expecting? Were these expectations met?	• Thought Gr7 would show gap between Grade 6 • What could I do to prepare them for for Grade 7 not sure if I know what the Grade 7 teacher wants me to do • See where the students are going • Different methods of teaching • Seeing the constraints in rotary or highschool (small room etc)
SURPRISES What surprised you throughout this process?	• Physical space and lack of fools around in the room, no posters/ anchor charts it was so bare! Not super inviting in HS especially but they share the room with so many people. • Lack of materials beyond Grade 6 • Physical space was challenging, no room to move sometimes • Not a lot of talk in higher grades • The wooden desk with built in chair where crazy • Kids are so big and with the furniture we couldn't move around • All had phones • Chromebooks with each kid

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Teacher Perspectives: Video

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Our Learning

Out of Classroom

Initial Planning

FOCUS: Building Continuum

Capacity Building

Field Testing Questions

In Classroom

Prep the Lesson

Debrief & Continuum

Co-teach & Observe

Repeat cycle for Grade 6, 7/8, 9

Reflect & Consolidate

Follow-Up with Group Later

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"It was amazing to see where this problem would go in Grade 9 and how quickly the complexity jumps."

~ Grade 7 Teacher

"I was surprised by how you could use the same problem in four different grades."

~ Grade 8 Teacher

"It was helpful to learn what other schools are doing. Without this structure it's impossible to see it. Getting us to see lessons was helpful."

~ Grade 9 Teacher

"I liked watching the students do the math - how they did it was different from what I expected."

~ Grade 9 Teacher

"We didn't know graphing had anything to do with algebra and I went back and it's totally in the curriculum."

~ Grade 6 Teacher

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