

EDMONTON CATHOLIC SCHOOLS &
UNIVERSITY OF ALBERTA

EARLY NUMERACY PARTNERSHIPS:
EXPLORING PROFESSIONAL
DEVELOPMENT TO ENHANCE EARLY
NUMERACY

AMY SWINKELS & STEPHANIE POWER

NCTM Annual Conference 2018 – Washington D.C.



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EARLY NUMERACY PROFESSIONAL DEVELOPMENT PROJECT

Monthly Professional Development Sessions

Thursday Mornings (3 hours): October 2016 – June 2018

NUMERACY COHORT:

- Preschool (100 Voices) Teachers + Early Learning Facilitators (9 teams)
 - Early Learning Consultants (Amy Swinkels & Stephanie Power)
- University Mathematics Education Researchers (Dr. Lynn McGarvey, Nicole Jamison, Barbara O'Connor)

PRESCHOOL MATHEMATICS

- Early exposure to mathematics has a tremendous impact on children's readiness for school and later school success (Bagiati, Yoon, Evangelou & Ngambeki, 2010)
- Mathematical thinking, however, beyond counting and shape labelling, has not been part of the educational experiences of many preschool teachers (Ginsburg, Lee, & Boyd, 2008)
- As a result, opportunities for rich mathematical interactions may go unnoticed (Ginsburg, Lee, & Boyd, 2008; Clements, Sarama & DiBiase, 2004)

EARLY NUMERACY PROFESSIONAL DEVELOPMENT PROJECT

PROFESSIONAL DEVELOPMENT GOALS:

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1ST PROFESSIONAL DEVELOPMENT SESSION (OCTOBER)

- Introduction to the early numeracy professional development project & participant survey

SURVEY:

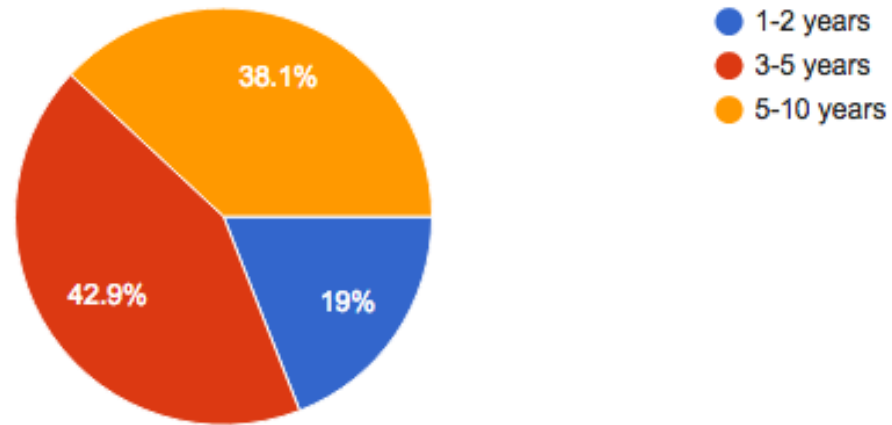
- Profile of the participants
- Personal experiences and comfort with mathematics
- Current preschool practices
- Learning goals the cohort hoped to achieve while participating

- Results were used by the university researchers and early learning consultants to collaboratively plan and deliver subsequent PD sessions for the year.

NUMERACY COHORT PARTICIPANTS

COHORT DEMOGRAPHICS:

How long have you been part of the 100 Voices Program? (21 responses)



NUMERACY COHORT PARTICIPANTS

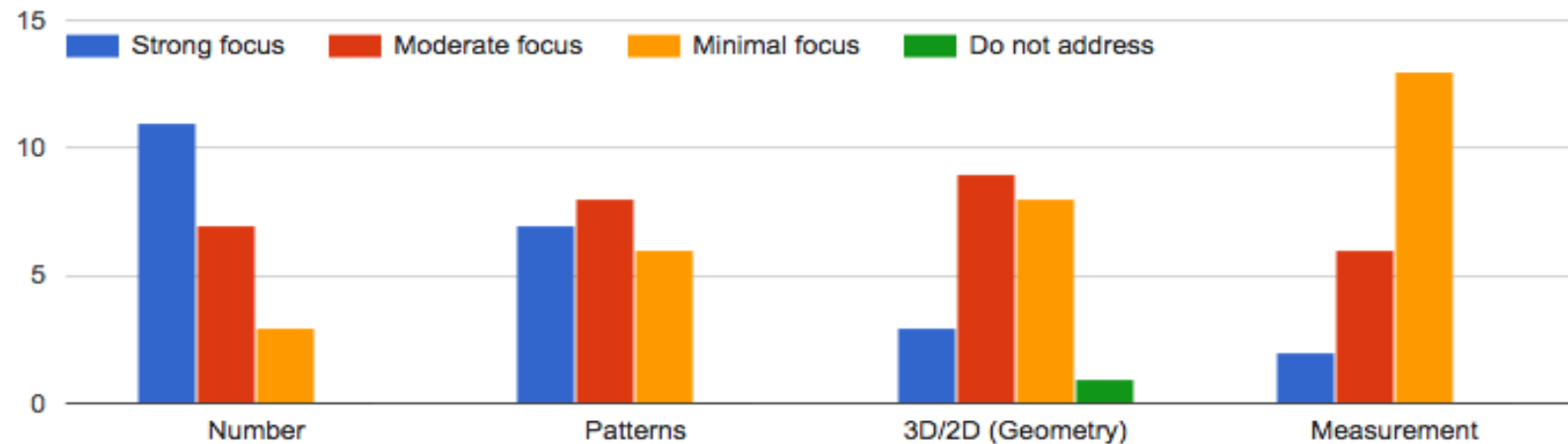
PERSONAL EXPERIENCES WITH MATHEMATICS:

- 48% of the participants had positive experiences with mathematics and still do
- 29% struggled with mathematics in school and still do not feel confident
- 14% struggled in school but it is now an area of interest

NUMERACY COHORT PARTICIPANTS

CURRENT CLASSROOM PRACTICES:

The Kindergarten curriculum is based on the following four strands/substrands. Indicate how strongly you focus on these topics in your program.



NUMERACY COHORT PARTICIPANTS

CURRENT MATHEMATICS RESOURCES:

- Pinterest
- Previously used mathematics ideas and materials
- Coworkers or preschool team
- Storybooks and literacy

NUMERACY COHORT PARTICIPANTS

COLLECTIVE LEARNING GOALS:

- How to incorporate more mathematics into classroom activities?
- What is considered developmentally or age appropriate?
- How to have purposeful, meaningful, interesting and fun mathematics?
- How to communicate and share mathematics information with parents?

NUMERACY COHORT PARTICIPANTS

COLLECTIVE LEARNING GOALS:

- Wanted opportunities for collaborative sharing of ideas
- Interested in increasing personal confidence with mathematics
- Interested in increasing mathematics knowledge and strategies

SUBSEQUENT PROFESSIONAL DEVELOPMENT SESSIONS

NOVEMBER	2D Geometry (Shapes)
DECEMBER	3D Geometry (Spatial Literacy/Orientation)
JANUARY	Measurement (Direct Comparison/Ordering)
FEBRUARY	Data Analysis
MARCH	Patterns & Relations (Pattern Core)
APRIL	Number (Counting/Subitizing)
MAY	Mathematical Opportunities within Classroom Routines
JUNE	Wrap Up & Concluding Mathematics Survey

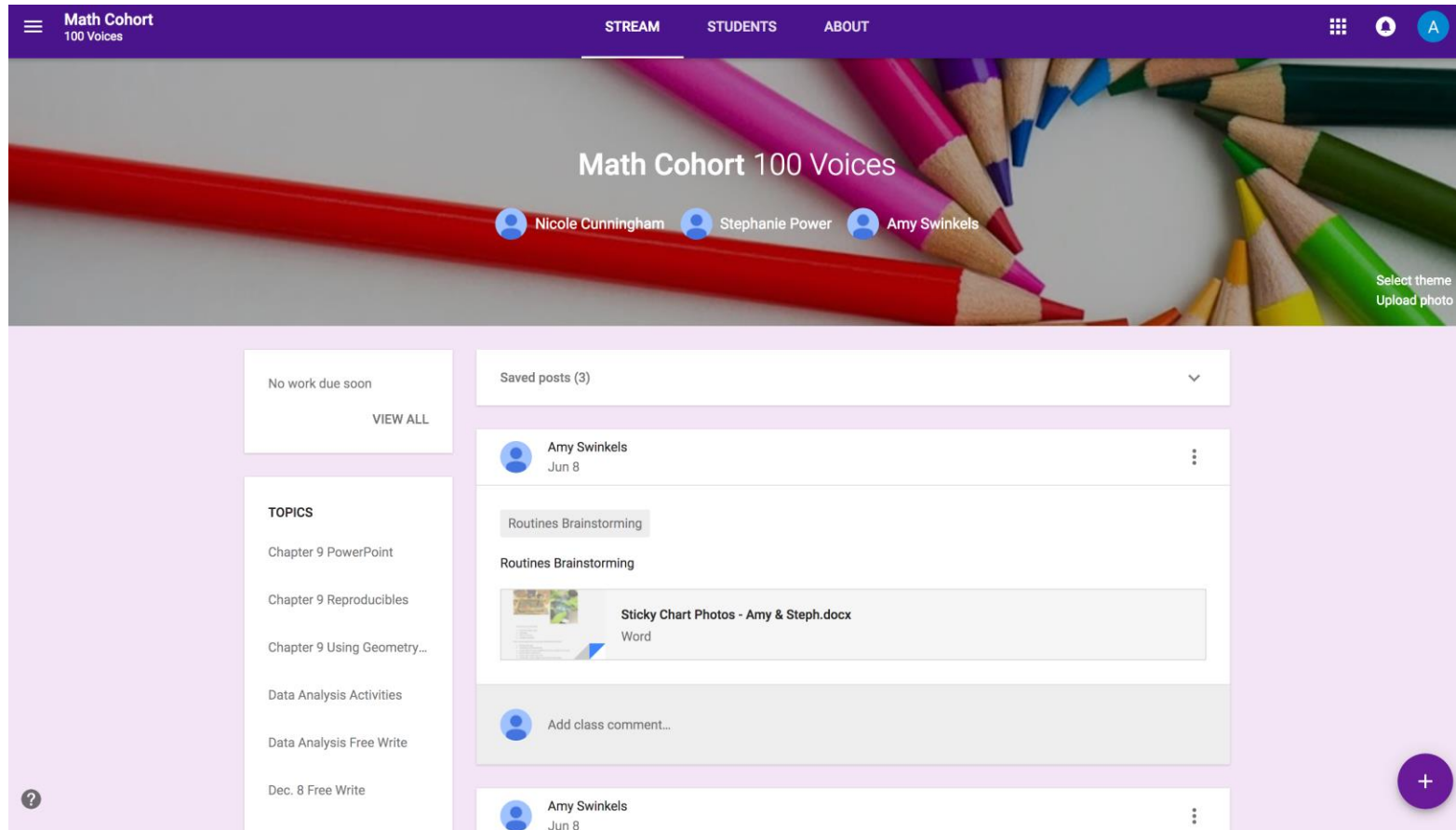
FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

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1. Group sharing of classroom practices/activities related to the previous PD's focus

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The screenshot displays a digital interface for a 'Math Cohort 100 Voices' stream. The top navigation bar is purple with a menu icon, the text 'Math Cohort 100 Voices', and links for 'STREAM', 'STUDENTS', and 'ABOUT'. On the right side of the bar are icons for a grid, notifications, and a profile. The main content area features a text post from a user named 'A' that discusses subitizing and quantity/cardinality activities, mentioning attached lesson plans and assessment sheets. Below the text is a vertical list of eight image thumbnails, each labeled with a filename (IMG_1227.JPG through IMG_1259.JPG) and the word 'Image'. A bottom bar includes a question mark icon, a comment input field with a user icon and the text 'Add class comment...', and a purple circular button with a white plus sign.

FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

2. Written reflections on understandings/practices related to a specific focus/strand in mathematics

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  Amy Swinkels
Apr 6

Patterns and Relations

Patterns Free Write: 1)What do you think are the key ideas of patterns for young children? 2) Do you think it is important to teach patterns to your students? Explain and 3) What is one activity or action you observed related to patterns ideas within the past couple of weeks?

9
DONE

25
NOT DONE

3 class comments 

FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

3. Presentation of current research, best practices, and discussion of challenges for a specific focus/strand in mathematics

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SPATIAL ORIENTATION

- First geometric experiences involve moving & using location (Andrews, 1996)
- One's own position and movement through space --> abstract perspectives of maps/ coordinates/ symbols (Sarama & Clements, 2009)
- Goal: help children develop an intuitive feel for their surroundings & objects in them
- Can use a variety of indoor & outdoor activities --> movement/ music/ literature

SPATIAL ORIENTATION

LANGUAGE OF SPACE

(Sarama & Clements, 2009)

1. **In/ On/ Under** (topology) & **Up/ Down** (directionality)
2. **Beside/ Between** (proximity)
3. **In Front Of/ Behind** (frames of reference)
4. **Left/ Right** (learned later --> 6 - 8 years of age)

Block Building

- Block building is an effective tool to build spatial understandings (Caldera et al., 1999; Casey et al., 2008)
- Storytelling can give an effective context to improving spatial skills (Casey et al., 2008)
- Context can make mathematics meaningful to children (Casey, Erkut, Ceder, & Young, 2008)
- Embedding the mathematics in a context improves understanding and retention (Casey, Erkut, Ceder, & Young, 2008)

Research and Best Practices in Patterns and Relation Activities

Patterns and Relations (Patterns)

K-9 PROGRAM OF STUDIES, Alberta Education 2016

General Outcome: Use patterns to describe the world and to solve problems.

Kindergarten Specific Outcome

1. Demonstrate an understanding of repeating patterns (two or three elements) by:
 - identifying
 - reproducing
 - extending
 - creating patterns using manipulatives, sounds and actions.

FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

4. Hands-on participation in teacher and student activities for a specific focus/strand in mathematics

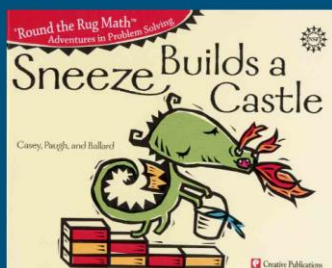
FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

4. Hands-on participation in teacher and student activities for a specific focus/strand in mathematics

Block building activity

As you are working:

- What spatial reasoning skills are being used in each task in the activity?
- What problem solving and mathematical language is being built through the task?



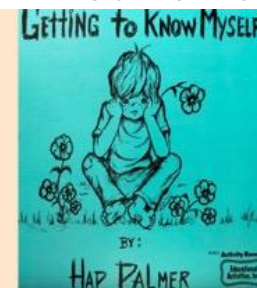
Hap Palmer - The Circle Game

Getting to Know Myself Album

https://www.youtube.com/watch?v=6Rm3p_Q4Fc (Circle Game at 14:31.)

Children doing circle game dance

<https://www.youtube.com/watch?v=E13mx2zBcQ>



Where is the mathematics?

What spatial understanding is developed?

What might you do to make the spatial aspects of the dance more explicit for children?

- Select a spatial word from Rosie's Walk or the list below:

- **In/ Out**
- **Forward/ Backward**
- **Top/ Bottom**
- **Around/ Through**
- **Over/ Under**
- **In Front/ Behind**
- **Up/ Down**
- **Above/ Below**

- Draw a picture representing the word & action using a prop in the room as a reference point
- If you finish early, select another word(s) to draw
- Stack the drawings in a pile for your table group to use

SPATIAL ORIENTATION ACTIVITIES

1. **SPATIAL TABLEAU:** Select one of the cards and create a still image using your body (and props) to represent the spatial word for your group to guess
 2. **SPATIAL OBSTACLE COURSE:** As a group, place your cards in a sequence and create an obstacle course (using props - i.e., chairs, tables, other items). Say your spatial action as you complete the movements
- If you finish your obstacle course:
 - Try it again by moving in a different way (i.e., tiptoe, crawl, etc.)
 - Rearrange your cards and create a new obstacle course



FORMAT OF PROFESSIONAL DEVELOPMENT SESSIONS

5. Collaborative planning time for teacher and facilitator teams (commit to try)

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Name of Centre: _____ Created By: _____

Role of Materials	Learning Goals: SHAPE AND SPACE (Measurement) General Outcome Describe the characteristics of 3-D objects and 2-D shapes and analyze the relationships among them. Specific Outcomes 2. Sort 3-D objects, using a single attribute. [C, CN, PS, R, V] 3. Build and describe 3-D objects. [CN, PS, V]	Assessment: Portfolio Artifact: Documentation:
Literacy Connections:		UDL Strategies: <input type="checkbox"/> SLP <input type="checkbox"/> EBS <input type="checkbox"/> OT <input type="checkbox"/> AP <input type="checkbox"/> PT Intentional Groupings: MDT Strategies Used:
Technology (iPad, Smart Board, Computer, Camera)	Intentional Questions:	Role of the Teacher/ELF/EA:

PRELIMINARY FINDINGS

PROFESSIONAL DEVELOPMENT GOALS:

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GEOMETRY REFLECTIONS

Initial Understandings

- Learning about shapes (labelling/observing)
- Spatial awareness and visual perception (2)
- Connection to measurement (1)

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GEOMETRY REFLECTIONS

Initial Understandings

- Learning about shapes (labelling/observing)
- Spatial awareness and visual perception (2)
- Connection to measurement (1)

After PD Session/Classroom Implementation

- Distinction between 2D shapes and 3D objects
- Identifying shapes (labelling) but also attributes/classifying/ comparing
- Building 2D shapes and 3D objects
- Spatial awareness, directions, mapping, and sequencing
- Connection to measurement and number sense

PRELIMINARY FINDINGS

1. To increase teachers' and facilitators' knowledge and awareness of mathematics appropriate for young children and the ways they might support children's learning

FINAL SURVEY REFLECTIONS

- “I feel more confident in planning appropriate activities focusing on Math for this age group”
- “As an educator, I gained increasing confidence in math concepts”
- “I have become more aware of purposeful, developmentally appropriate ‘math’ activities”

PRELIMINARY FINDINGS

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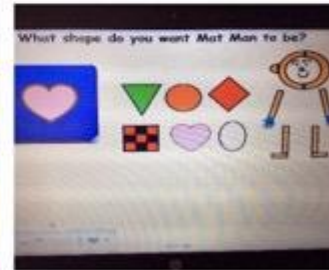
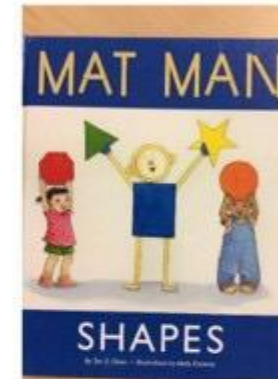
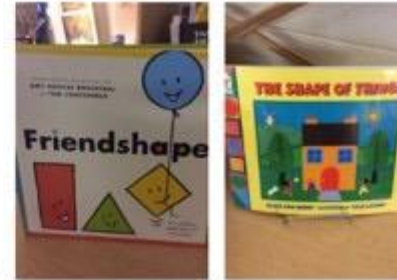
- “Participating in this cohort has drastically changed the intentionality of our whole group and small group numeracy conversations. We have as a classroom staff pushed ourselves to think more mathematically in the classroom and encourage students to do so. Our preconceived notions of what our students can understand with respect to mathematics has changed drastically”

CLASSROOM EXAMPLES

EXPLORING SHAPES

In 100 Voices we have read several books about shapes and finding shapes everywhere! We use shapes to draw ourselves, we match shapes to things in the world, we put together shape puzzles, use shape blocks to build, and look for shapes on our clothes.

Not only is it fun to explore shapes, it is great for building language, it is great for paying attention to details: matching, noticing similarities and differences, comparing sizes, looking at colors, exploring what you can build with different shapes, sorting various shapes, etc. It assists with early numeracy, community and environmental awareness, early literacy and more!



CLASSROOM EXAMPLES

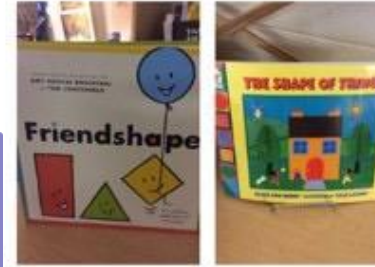
Familiar activities:

- Read books about shapes
- Find shapes in the environment
- Explore shapes with puzzles

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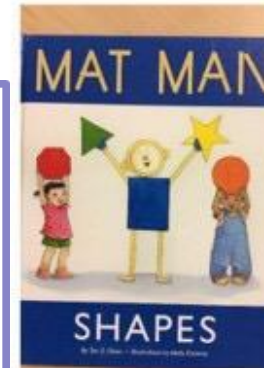
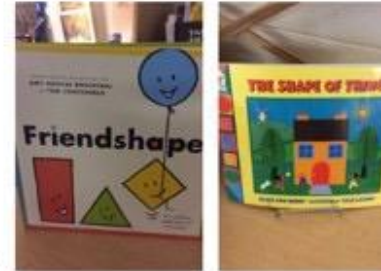


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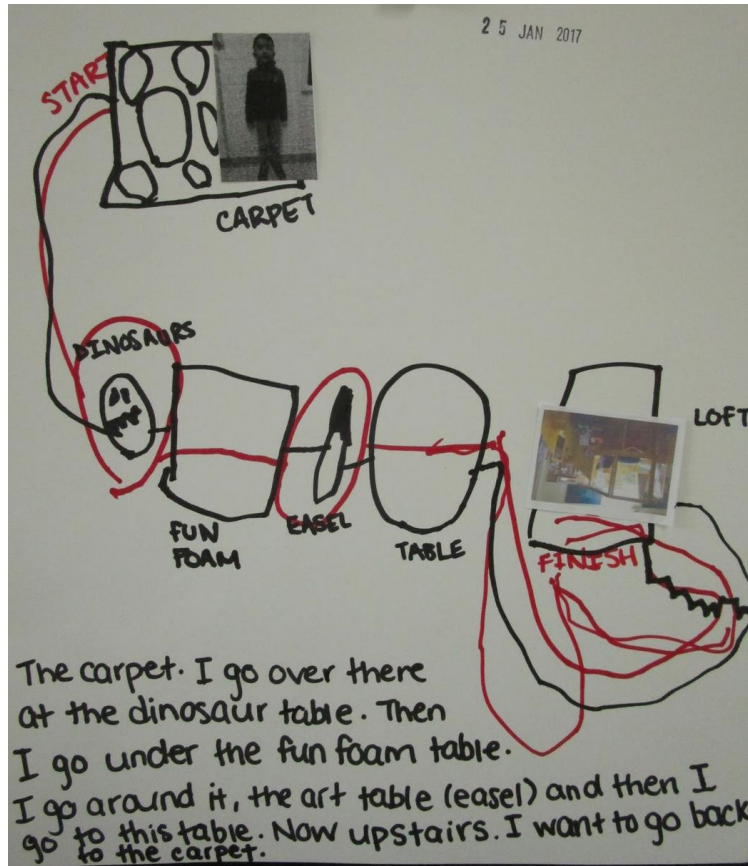
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New activities:

- Match shapes
- Display shapes in different rotations
- Notice similarities and differences
- Sort shapes (attributes)

CLASSROOM EXAMPLES



100 Voices Walk Outside

When the weather was warm enough we took a walk around the playground. The children told me what they were doing... working in our prepositions!

- "On top of the table"
- "Behind the bars"
- "Down the stairs"
- "Up the stairs"
- "On the snow"
- "On top"
- "Across the steps"
- "Inside the tube"



PIC-COLLAGE

New activities:

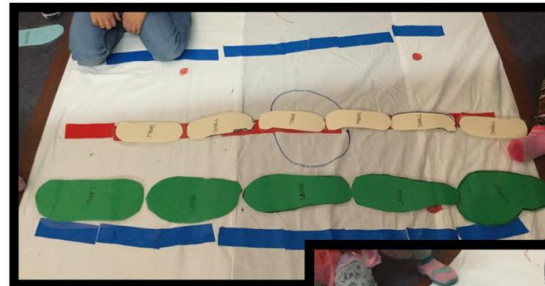
- Focus on spatial orientation for geometry
- Use more prepositions in a variety of activities

CLASSROOM EXAMPLES

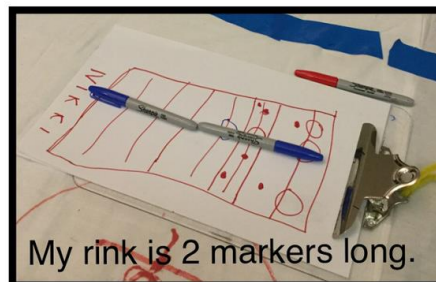
HOW WIDE IS OUR HOCKEY RINK?

PART 3

The teacher reflected upon the difficulties previous groups had measuring the length and decided to try measuring the width of the hockey rink instead. This distance is shorter and we knew we would have enough materials the same size to help the children be more successful in finishing the measurements with concrete objects.



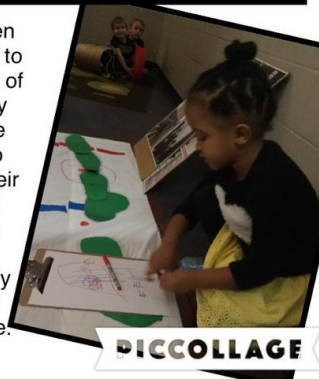
The children were more successful measuring the width. They were able to find many materials to use such as books, markers, large and small skates. They counted and compared the objects. Eg: 'We have more markers than books.' 'The books are not all the same size so we need to change them.' 'The markers are too long.'



My rink is 2 markers long.

The children were asked to draw a map of our hockey rink. Some decided to measure their rink when they were done.

Elyanah: My rink is one marker wide.



EDMONTON CATHOLIC SCHOOLS



CLASSROOM EXAMPLES

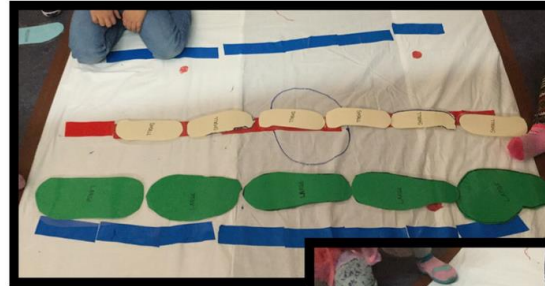
Familiar activities:

- Introducing measuring with nonstandard units and concrete objects

HOW WIDE IS OUR HOCKEY RINK?

PART 3

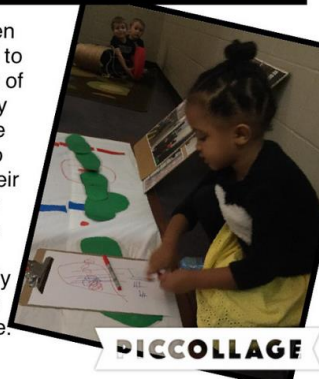
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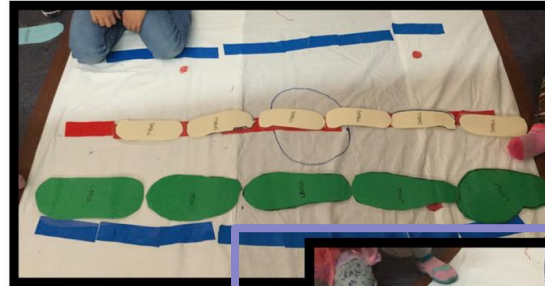
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CLASSROOM EXAMPLES

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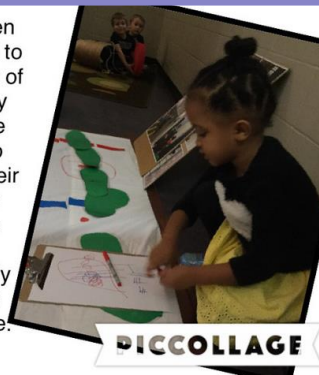
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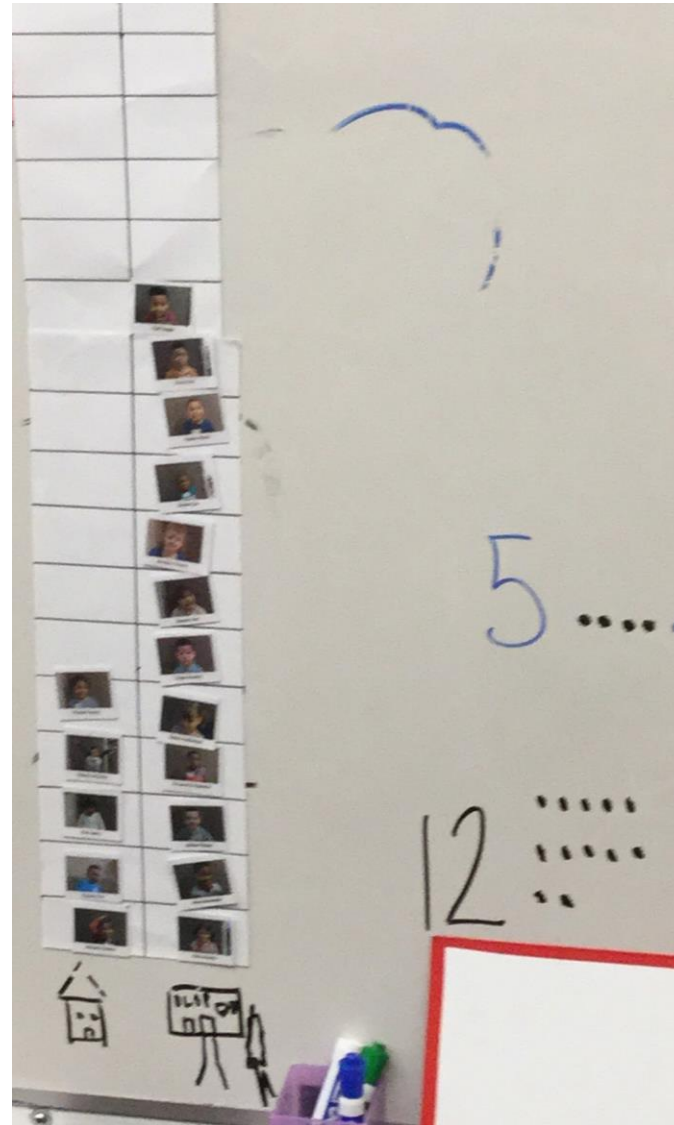
New activities:

- Using a variety of nonstandard units and concrete objects to measure
- Discussion about which unit was more or less (comparing quantities)

CLASSROOM EXAMPLES

New activities:

- Completing daily surveys
- Graphing the results
- Analyzing and discussing the results



CLASSROOM EXAMPLES



100 VOICES EARLY NUMERACY: SUBITIZING 1-6

Our helper of the day not only gets to do the daily duties and leadership roles, recently they have been getting to test their friends by showing them groups of dots up to 6. On a baking sheet they get to place circle magnets on it and flip it over fast and everyone gets to guess the number of dots by showing us with their hands! Then they really like to count the dots after to check if they were right...

New activities:

- Focus on subitizing for number
- Showing small quantities in a variety of ways



EDMONTON CATHOLIC SCHOOLS



PRELIMINARY FINDINGS

2. Change teaching practices so that educators purposefully plan for rich mathematical experiences and capitalize on mathematical opportunities that take place during common classroom routines and activities

FINAL SURVEY REFLECTIONS

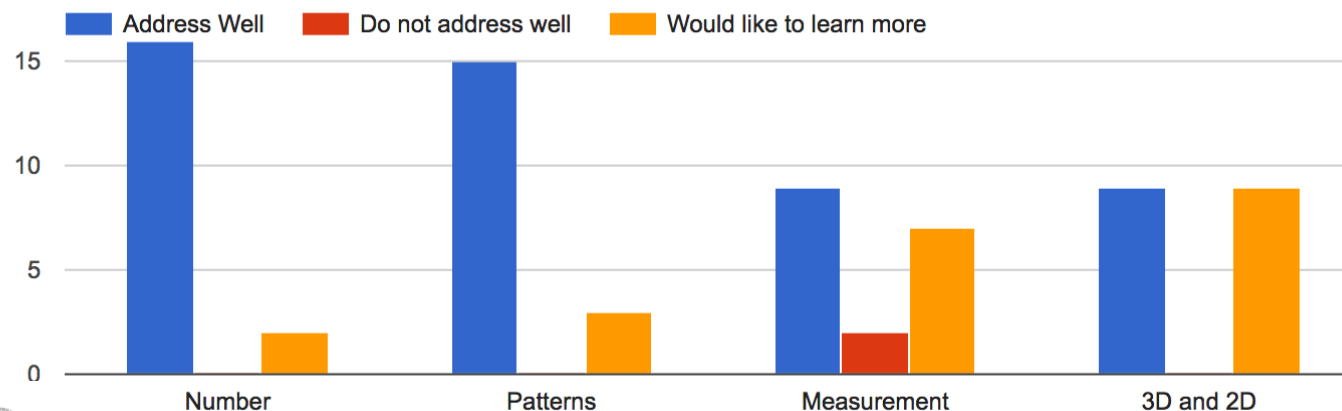
- “I have realized that mathematics is much more than just counting with children. Math is part of everyday in our classroom”
- “This cohort has reaffirmed the notion that children in early childhood classrooms know and understand more than we give them credit for”

PRELIMINARY FINDINGS

2. Change teaching practices so that educators purposefully plan for rich mathematical experiences and capitalize on mathematical opportunities that take place during common classroom routines and activities

REFLECTING ON CLASSROOM PRACTICES:

The Kindergarten Curriculum is based on the following four strands/substrands. Indicate how strongly you focused this year on these topics in your program.



PROJECT EXPANSION FOR 2017-2018

- Continue to work with the current preschool numeracy cohort (15 educators)
- Expand to a second preschool cohort (20 educators)
- Expand to all kindergarten teachers (45 teachers)
- Develop an early learning mathematics resource for preschool and kindergarten

THANK YOU!

AMY SWINKELS & STEPHANIE POWER

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- Bagiati, A., Yoon, S. Y., Evangelou, D., & Ngambeki, I. (2010). Engineering curricula in early education: Describing the landscape of open resources. *Early Childhood Research & Practice*, 12(2). 1-15.
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