EarlyMath@Home Activities

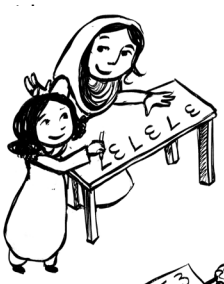
Sandy Youmans and Lynda Colgan, Queen's University
Edward Schroeter, Kawartha Pine Ridge District School Board

PRESENTATION

Early math skills are critical because they lay a foundation for future math, school, and life success. While many parents regularly participate in literacy activities with their young children (e.g., reading books, teaching the alphabet), this is not usually the case with numeracy. To help parents engage in fun early numeracy activities with their children, the Critical Transitions in Early Math Community of Practice developed EarlyMath@Home activities. To support diverse learners, EarlyMath@Home activities consist of engaging hands-on tasks, with ideas for extra practice. In addition, each activity is communicated through short blocks of text and illustrations to make the tasks easy to understand. This presentation highlights the importance of parent engagement in math and shares sample EarlyMath@Home activities.

QUESTIONS FOR DISCUSSION

- What types of learning activities do parents normally engage in with their children? Why?
- What is parent engagement? Why is it important?
- What are the benefits of parent engagement in math?
- What do you think about the EarlyMath@Home activities?
- How can you share the EarlyMath@Home activi your school community?



KEY IDEAS

- Parent engagement in math promotes children's school and life success
- It is important for young children to develop positive attitudes towards math and early math skills
- EarlyMath@Home activities are a free resource to help families engage in fun numeracy activities with young children

RESOURCE LINKS

- Access EarlyMath@Home activities here: https://queensmstegroup.ca/index.php/2021/10/22/building-math-into-your-day-math-y-activities-for-little-learners-their-family-and-friends/
- Connect on Twitter @EarlyMathAtHome
- Ontario's Parent Engagement Policy - http://www.edu.gov.on.ca/eng/parents/policy.html
- Bedtime Math - https://bedtimemath.org/
- Math Storytime - http://www.mathstorytime.ca/en

The EMA@School Numeracy Assessment

Heather Douglas, PhD, Carleton University

PRESENTATION

This presentation is a discussion about the Early Math Assessment@School (EMA@School) numeracy screener. This tool was developed for Alberta Education and has thus far, been used with over 30 000 students. The assessments include a battery of tasks that tap into children's developing mathematical knowledge (see Figure 1). Specifically, the assessments capture children's knowledge of symbolic numbers in kindergarten to Grade 3. The assessments are rooted in current theory on mathematical cognition and development. They are administered individually at the kindergarten level and as a classroom activity for students in Grades 1 to 3. Importantly, the test results can be used by teachers generally, to judge the skill level within their classroom and specifically, to identify students with weak number skills. The presentation includes a brief overview of the assessments and the theory behind the selection of tasks, answers to some frequently asked questions about the tool, and information about future plans to extend the testing and to work collaboratively with educators, creating and evaluating related numeracy interventions.

QUESTIONS FOR DISCUSSION

- What is early number knowledge?
- How does math assessment inform your teaching?
- What number skills do your students need to work on?
- What are you, your school, or your school board using to identify students at risk for math difficulties?
- What kinds of activities or teaching methods are you using to support students with weak math skills?
- What programs is your school or board using to promote strong math skills? How are they working?
- What do you need so that each student in your classroom can experience success in math?

KEY IDEAS

- Number knowledge is hierarchical, new knowledge is built on current knowledge
- Students need a strong foundational understanding of numbers and their relations for ongoing success in mathematics
- Early identification and timely intervention for students with gaps in mathematical knowledge and skills is critical for student success

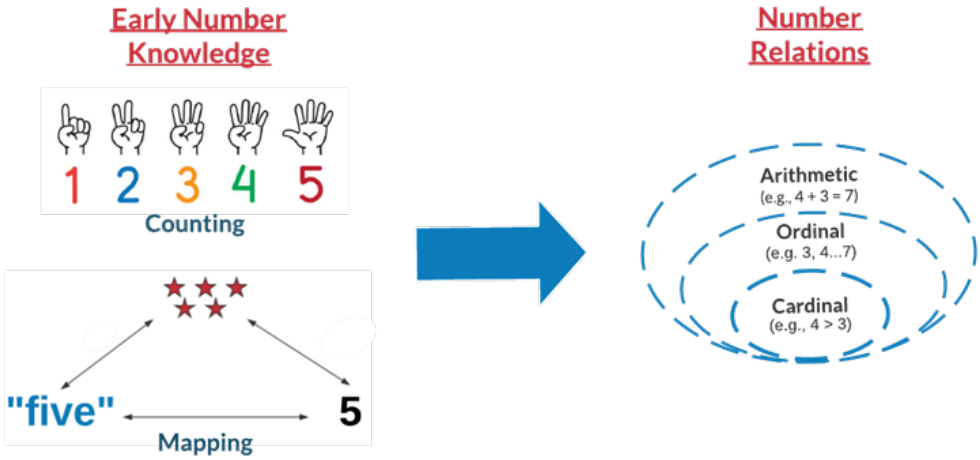


Figure 1.
Children's Developing Knowledge of Symbolic Numbers

Note: Adaptations for diverse learners should reflect the purpose of the assessment. For example, if the test results are being used to track individual student progress, then modifications such as allowing oral versus written responses can be used. If however, it is being used to develop norms or to compare student scores to normed values, we do not recommend modifications.

RESOURCE LINKS

Information About Assessment

- The Science of Math: https://www.thescienceofmath.com/universal-screening-in-mathematics
- Link to EMA@School Infographic and Interpretation Guide: (coming soon)
- Error analysis and instruction, Paul Riccomini: https://fdocuments.in/document/how-to-use-ath-error-analysis-to-improve-instruction-how-to-use-math-error-analysis.html

Information About Math Interventions

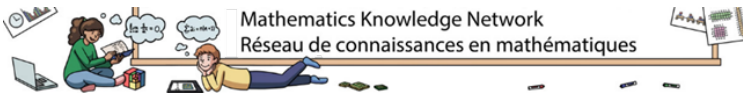
- National Centre on Intensive Intervention: https://intensiveintervention.org/training/course-content/intensive-intervention-mathematics
- 10 Key Mathematics Practices for all Elementary Schools: https://repositories.lib.utexas.edu/bitstream/handle/2152/74228/10Keys_ElemMath_Web.pdf?sequence=2&isAllowed=y

Activities to Promote Early Math Skills

- Development and Research in Early Math Education: https://dreme.stanford.edu
- Erikson Institute Early Math Collaborative: https://earlymath.erikson.edu

Early Math Development

- Mathematics Knowledge Network, Canadian Early Math Education Conference: http://mkn-rcm.ca/canadian-early-mathematics-education-ceme-conference/



CRITICAL TRANSITIONS IN Early Math

Queen's University | Faculty of Education

Carleton University

Why this Learning?

Angeline Humber, Teacher Consultant,
Greater Essex County District School Board

PRESENTATION

Getting to know your learner in mathematics involves not only understanding who they are as a growing individual, but also their needs as a budding mathematician. In order to support all students along their mathematics learning journeys, we must be able to notice and name where they are along the developmental continuum and provide purposeful prompts to move that learning forward. This ensures an equitable, inclusive and responsive mathematics program to meet the needs of all learners including marginalized students, English Language Learners, and students with special education needs. During this session, Angeline Humber, from Greater Essex County District School Board, describes her board's support of critical transitions in mathematics through the Early Years (K-3) in partnership with the Math Knowledge Network. She also shares resources that were developed, accessed, and shared based on their board team's learning and system needs.

QUESTIONS FOR DISCUSSION

What can I do to get to know each learner?

What are the implications of assessment to support student learning for all learners?

Am I able to respond to the question 'Why this learning for this learner at this time?'

How can I intentionally plan to support learning needs ensuring that I meet the needs of diverse learners?

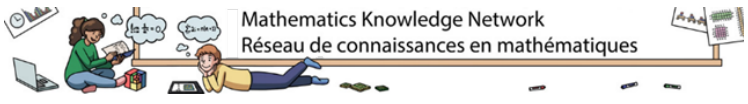
What professionally learning might I engage in to help me better support each learner?

KEY IDEAS

- Knowing each learner is a critical component of instruction.
- Educator understanding of developmental continua in mathematics supports effective assessment, planning and instruction for all learners.

RESOURCE LINKS

- GECDSB Math https://www.publicboard.ca/math/Pages/default.aspx#/=
- Learning Trajectories https://www.learningtrajectories.org/
- Pedagogical Documentation http://www.edugains.ca/resourcesLNS/Monographs/CapacityBuildingSeries/CBS_Pedagogical.pdf
- Pedagogical Documentation Revisited http://thelearningexchange.ca/wp-content/uploads/2015/02/Pedagogical-Documentation-Revisited-Looking-at-Assessment-and-Learning-in-New-Ways1.pdf
- How Does Learning Happen? https://files.ontario.ca/edu-how-does-learning-happen-en-2021-03-23.pdf
- http://www.edu.gov.on.ca/eng/general/elemsec/speced/learningforall2013.pdf
- https://www.cast.org/impact/universal-design-for-learning-udl
- https://www.ldatschool.ca/universal-design-for-learning-udl/



CRITICAL TRANSITIONS IN Early Math

Queen's University | Faculty of Education

Greater Essex County District School Board

Integrating Math Along a Play-Based Continuum

Hanna Wickstrom, PhD Candidate, University of Toronto

PRESENTATION

This presentation discusses early math learning and play in kindergarten education. It begins by explaining The Play Continuum; a description of play that acknowledges a range in both child and educator involvement. This contemporary notion of play pushes beyond more traditional views of free play to include a focus on educator-guided approaches to play-based learning. Next, examples are shared to demonstrate how early math learning can be integrated along The Play Continuum. Lastly, key resources are provided with additional information about play, early math learning, considerations for supporting diverse learners, as well as and practical examples to support the implementation of math and play-based learning in kindergarten classrooms.

QUESTIONS FOR DISCUSSION

What is the Play Continuum?

How is the Play Continuum helpful for planning play-based learning?

What types of play-based learning are you most comfortable with?

What types of play-based learning would you like to learn more about?

What play-based math learning have you incorporated in your classroom?

What play-based math learning would you like to learn more about?

KEY IDEAS

- Play can be viewed as a continuum, ranging in level of child and educator involvement.
- Children can acquire both developmental and academic skills through play.
- Play-based learning is an effective pedagogy to support early math development.
- Mutually-directed play is the “sweet spot” for math learning. When children learn through mutually-directed play they acquire, and retain, more math knowledge.

RESOURCE LINKS

Information About Play

- Encyclopedia of Child Development: http://www.child-encyclopedia.com/play-based-learning/according-experts
- The Play Continuum Infographic: https://d3096fe6-8445-4c80-b9dd-56bf027992e7.filesusr.com/ugd/c6ec1d_92905ab165494214a948d6027cb35ea5.pdf
- Play Learning Lab Website: https://www.playlearninglab.ca/about-the-play-continuum
- Early Years Study, Chapter 2: https://earlyyearsstudy.ca/wp-content/uploads/2020/02/EYS4-Report_01_15_2020.pdf

Examples to Support the Implementation of Play-Based Learning

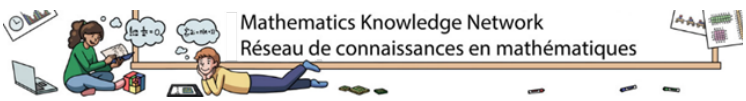
- The Play Learning Lab Website: https://www.playlearninglab.ca/examples-of-play
- The Play Learning Lab Instagram Account: https://www.instagram.com/playlearninglab/
- The Play Learning Lab Twitter Account: https://twitter.com/playlearninglab
- Deanna McLennan Twitter Account: https://twitter.com/McLennan1977

Information About Early Math Development

- The Learning Trajectories Website: https://www.learningtrajectories.org/
- Tips for Read Alouds in Math: https://www.learningtrajectories.org/documents/1582239622565.pdf

Resources for Diverse Learners:

- All Play Learn: https://allplaylearn.org.au/early/early-educator-resources/
- Tips for Inclusive Small Group Work: http://archive.brookespublishing.com/content/blog/sandall-download-small-group-activities.pdf
- Division for Early Childhood of the Council for Exceptional Children Recommended Practices: https://divisionearlychildhood.egnyte.com/dl/b3QfKC3jsp
- STEM for Inclusive Excellence and Equity: https://www.researchgate.net/profile/Douglas-Clements-2/publication/341249563_STEM_for_Inclusive_Excellence_and_Equity/links/5eb5668c92851cd50da21d56/STEM-for-Inclusive-Excellence-and-Equity.pdf
- Starfall: https://www.starfall.com/h/index.php
- Math Before Bed (Number Talks): https://mathbeforebed.com/



CRITICAL TRANSITIONS IN Early Math

Play Learning Lab

UNIVERSITY OF TORONTO
OISE | ONTARIO INSTITUTE FOR STUDIES IN EDUCATION

Queen's University | FACULTY OF EDUCATION

The Roots of Coding

Lynda Colgan and **Sandy Youmans** (Queen's University)
Melanie Martin (Kawartha Pine Ridge District School Board)

PRESENTATION

Although coding has been included in some curricula across Canada since 2017, it was introduced formally in Ontario only on June 23, 2020, with the launch of the new Grade 1-8 math curriculum which stipulates that educators will *teach coding or computer programming skills starting in Grade 1 to improve problem solving and fluency with technology [and] to prepare students for jobs of the future.* [1]

It is in response to that mandate that we share the first set of early math coding resources, developed and field-tested by classroom teachers in real schoolrooms using familiar materials, vocabulary and contexts. Our goal is to equip teachers and early childhood educators with trustworthy lessons and activities that will meet Kindergarten/ Grade 1 curriculum expectations related to the spatial thinking concepts that accomplish *coding* objectives.

One important construct in geometry is the notion of *space*. Children learn how objects relate to one another and to us in space: the robin is on top of the bird feeder, the bird feeder is under the tree limb, and we are in front of both the bird feeder and the robin. The goal of the first set of activities is to deepen children's conceptual understanding of *position* and learn correct mathematical words for talking about it.

> *Use a 3 X 3 grid: draw a red heart in the middle square; draw a green leaf in the square to the right of the red heart; draw a yellow fish in the square above the red heart; draw a yellow sun to the left of the yellow fish; draw an orange flower in the bottom left square; and, draw a blue bird in the square below the green leaf. How many squares are blank? Stand a book between you and a partner. Take turns using words to tell your partner where and what to draw to fill each blank square.*

The Roots of Coding Activities have sections which allow teachers to support all learners. After the description of each activity, a 'Look Fors' section outlines what teachers might see and hear. This helps focus teacher observations and encourages teachers to adopt an 'asset stance' – noticing what a student can do. The 'Reflection' section includes questions to help teachers think analytically about what students demonstrated with respect to their strengths, interests, and learning needs. Having gone through this process, teachers are then able to use the "Next Steps" provided to guide decisions for further instruction. These Next Steps are broken down into two parts; what teachers can try if students found the activity challenging, and what teachers might do to extend student learning. In this way, teachers are supported in using the activities in the Roots of Coding resource to benefit all learners.

QUESTIONS FOR DISCUSSION

What are sensorimotor tasks and why are they important?

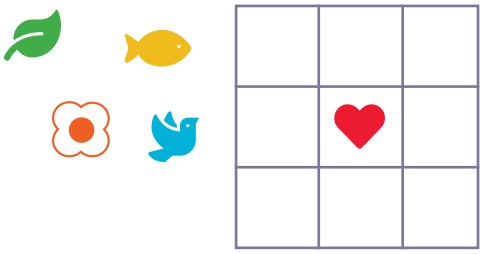
What is positional language?

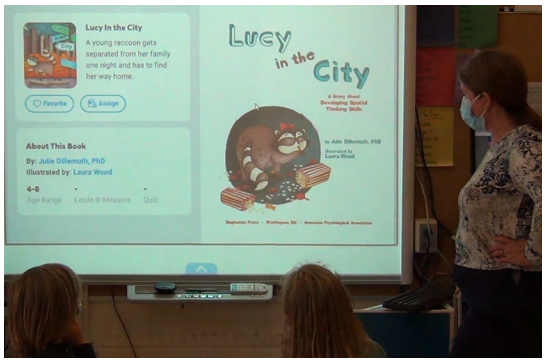
What does positional language have to do with coding and computational thinking?

1 Ontario Introduces New Math Curriculum for Elementary Students (Focus on the Fundamentals will Better Prepare Students for Jobs of the Future) June 23, 2020 https://news.ontario.ca/en/release/57343/ontario-introduces-new-math-curriculum-for-elementary-students

KEY IDEAS

- Children need to learn positional words such as above or next to and they need to know the concepts to which these words refer. For example, the words next to refer to a concept specifying that an object is adjacent to another in a variety of ways, either on its right or its left.
- Left and right are exceptionally difficult for young children to learn, and they need a lot of practice with these ideas. First, children need to remember that one hand is on the right and the other is on the left, then they must apply the idea of right and left to external objects.
- Positions and locations are abstract ideas, and all are relative.
- Those children who acquire a solid understanding of space and spatial language tend to demonstrate higher math achievement than students who do not achieve such mastery.





Draw a big circle.

Draw a red bug inside the circle.

Draw a green bud outside the circle.

Draw a black bug on the circle.

Make a tower with a red cube, a yellow cube and a blue cube. Put the red cube on the bottom. Put the yellow cube on the top. Where is the blue cube. Draw your tower.

I see 5 cubes. The yellow cube in in fron of the red cube. The green cube is behind the red cube. the orange cube is in between the green cube and the blue cube.

RESOURCE LINKS

Books about Spatial Sense

- Moss, J., Bruce, C., Caswell, B., Flynn, T., & Hawes, Z. (2016). Taking shape: Activities to develop geometric and spatial thinking. New York, NY: Pearson
- Taking Shape web resources: www.pearsoncanada.ca/takingshape

Children's Books about positional words

- See list at https://growingbookbybook.com/positional-words-books/

Information About Early Math Development

- Clements, D. H., & Sarama, J. (2009). Learning and teaching early math: The learning trajectories approach. New York, NY: Routledge.
- The Early Math Collaborative – Erikson Institute. (2014). Big ideas of early mathematics: What teachers of young children need to know. Boston, MA: Pearson.