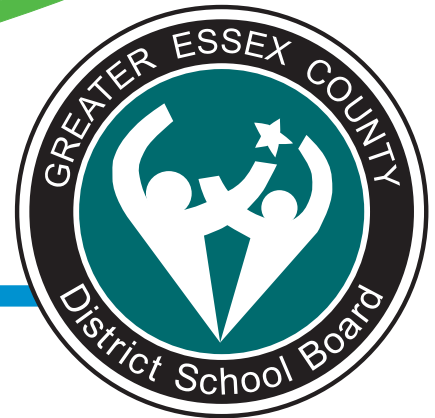
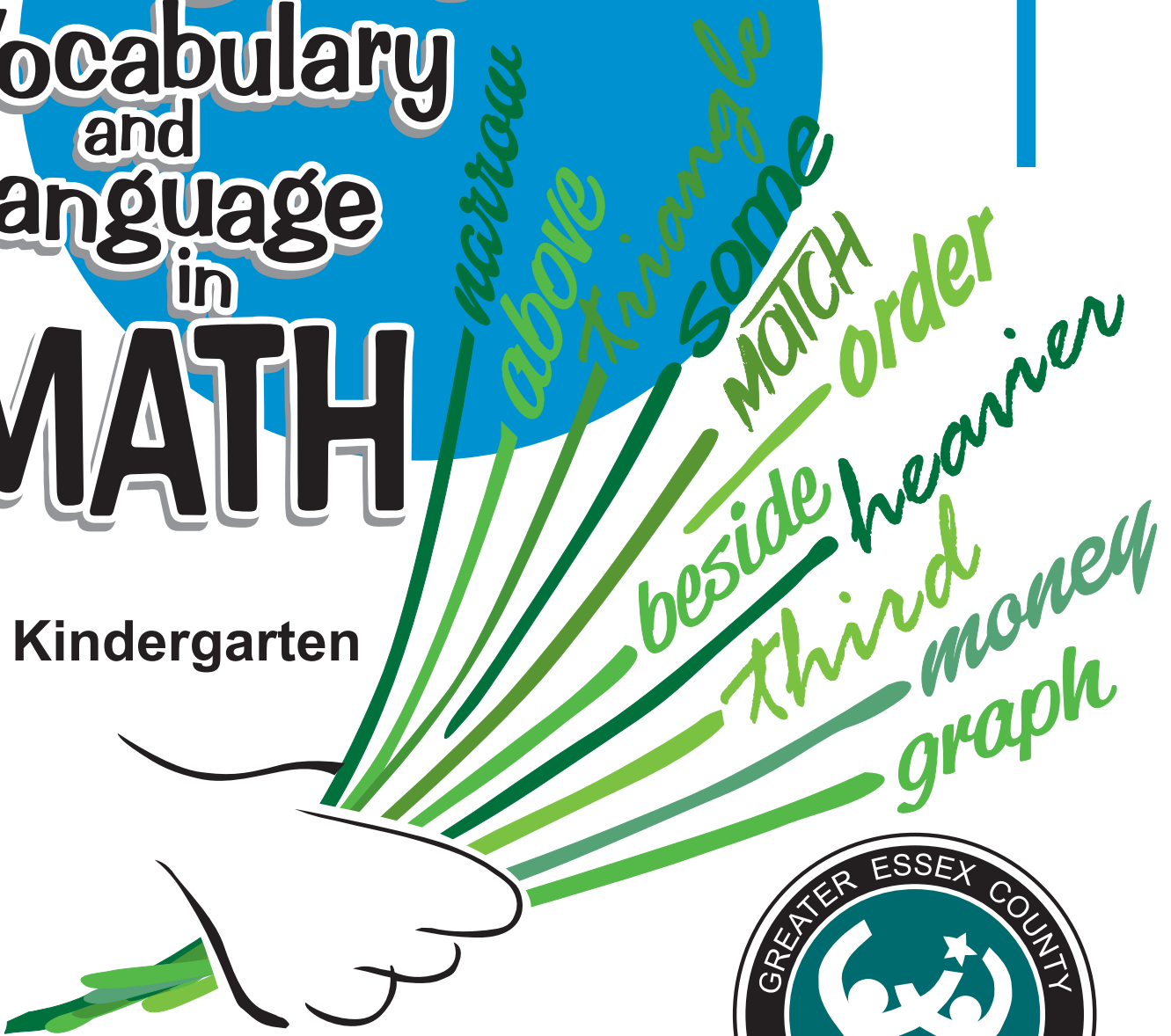


GROWING Vocabulary and Language in MATH

Kindergarten



May 2017

Understanding and using oral vocabulary is a critical building block to future learning. Research is clear that all students benefit from the explicit teaching of vocabulary. Struggling learners require specific interventions in response to their specific identified needs.

Vocabulary instruction is as important to math comprehension as it is to reading comprehension, especially because so much of today's math instruction and testing are administered using story problems. (Bruun, Diaz, and Dykes, 2015). In addition, mathematical process expectations include communicating mathematical thinking orally and in writing using everyday and math terminology.

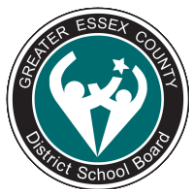
This resource provides the specific math vocabulary aligned to the Ontario Ministry of Education's Kindergarten Program (2016). Also included are assessment and intervention strategies for vocabulary development across the day.

Special appreciation is extended to our Math Vocabulary Committee members for the research and development of this resource: Melinda Hinch, Pam Badiuk, Jan Foy, Tammy Groulx, Marc Crundwell, Kelly Malcolm, Suzanne Shepley and Stephanie Paraschak. In addition, to Kyle Pierce and Angeline Humber for their work in aligning the project to the math proficiencies, the Kindergarten Program, and French Immersion.

The students of Southwood, Sandwich West and Amherstburg participated in the piloting stages of the project. Thank you!

Lynn McLaughlin

Lynn McLaughlin
Superintendent of Special Education Services
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REFERENCE:

Bruun, F., Diaz, J. M., Dykes, V. J. (May 2015), The Language of Mathematics. Teaching Children Mathematics, Vol 21 (9), 530-536.

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“Language plays an important role in learning mathematics”.

(Hughes, Powell, and Stevens, Teaching Exceptional Children, 2016)

Knowledge of oral vocabulary and language are major building blocks in all areas of children’s early development including literacy, math, and well-being. Strategies facilitating vocabulary and language development is an integral part of math instruction.

Many of our students struggle with language. Reasons are numerous. In our daily routines, we must take into account the needs of students that may be English Language Learners or learning a new language, have language delays or impairments, or come from environments that are not rich in conversation. These students require specific interventions for language development to ensure cross-curricular success.

In typical developing students, incidental learning of words occurs in small increments and is highly dependent of the learner’s verbal skills, memory, and number of times he or she encounters specific words. Word learning occurs at a very fast rate; school-age children can learn nine to twenty words per day. Most of that learning is incidental; words are heard and learned in social interactions and naturalistic contexts. Learning vocabulary through hearing, however, might not be sufficient or possible for some students. Research shows that *all students benefit from explicit teaching of vocabulary*, especially those that are abstract, out of context, or subject-specific. This requires the use of multiple exposures to the same word and educator scaffolding to help store, organize, and retrieve new words.

A resource has been made to support students in their acquisition of math vocabulary. It contains *content specific math vocabulary* and *relational concepts* aligned to the Ontario Ministry of Education’s Kindergarten Program (2016). It is not an exhaustive list. Ideally, educator teams work would together to identify a list of math vocabulary words that can be facilitated across the day in groups and in centres. Keeping in mind the developmental stages of all students, educators can consider:

- Choosing words that students require to access curricular expectations or individual education plans
- Posting words on word walls
- Using pedagogical documentation to capture children thinking and determine next steps for learning, and
- Teaching deliberately and explicitly.



Sections include:

- Kindergarten Vocabulary
- Assessment
- Responsive Educator Interactions
- Intervention Strategies
- Vocabulary Across the Day
- Template for Implementation

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Kindergarten Math Vocabulary (Cross-Curricular Relational Concepts and Content Specific)

above	equal	little
add	extend	match
after	few	make ten
alike	fewer than	measure
all	finish	medium
always	five	middle
and	flat	money
apart	forward	more
backward	four	more than
before	full	most
beginning	graph	narrow
behind	greater than	next
below	group	next to
beneath	half	nine
beside	heavier	number
between	heaviest	number line
big	heavy	never
biggest	height	one
bigger than	high	ones
bottom	higher	order
by	highest	ordinal number names (first, second, third, fourth...)
cents	horizontal	
centre	how many	out
circle	identical	outside
coin	in	oval
compare	in back of	pair
cone	in front of	pattern
corner	inside	prism
count	large	put together
count forward	larger	pyramid
count on	last	rectangle
create	least	right
cube	left	same
curve	length	same number
cylinder	less	separate
difference	less than	set
different	likely	seven
different number	light	several
dollars	lighter	shape
edge	lightest	share
eight	long	short
empty	longer	shorter
end	longest	

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estimate
even
every
skip
small
smaller
some
sort
shortest
sometimes
sphere
square
start
subtract
survey
symmetrical

low
lower
lowest
take away
taller
tallest
tally
temperature
ten
then
three
through
together
top
triangle
two

side
six
size
under
unlikely
vertex
vertices
vertical
volume
weight
whole
wide
width
2-d shape
3-d shape
zero

Please note that this list is designed as a reference only.

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ASSESSMENT

Pedagogical documentation makes student thinking and learning visible, allowing educators to assess oral vocabulary skills and guide differentiated instruction and development of future learning opportunities. Ongoing observation, documentation and assessment supports assessment for learning math vocabulary and informs instruction. Resources to support pedagogical documentation can be found at:

- Pedagogical Documentation –
<http://learnteachlead.ca/projects/resource-pages-k-3/?pcat=2868&sess=1>
- Making Learning Visible Through Pedagogical Documentation -
<http://www.edu.gov.on.ca/childcare/Wien.pdf>
- Capacity Building Series: Pedagogical Documentation –
http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_Pedagogical.pdf
- Capacity Building Series: Pedagogical Documentation Revisited -
http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_PedagogicalDocument.pdf
- Supporting ELLs in Kindergarten –
www.edu.gov.on.ca
www.edu.gov.on.ca/eng/document/kindergarten/kindergartenell.pdf

For more information regarding developmental stages, please contact your school's special education team including the Speech-Language Pathologist, Psychologist and/or Special Education Coordinator. For English Language Learners, please contact the ESL/ELD Department.



BEING A RESPONSIVE EDUCATOR ACROSS THE DAY: POP IN- POP OUT

The quality and quantity of adult talk in the classroom play an important role in student development including word learning and use. Students who are ELL and/or with oral language difficulties may need to hear a new word twice as often as their peers to understand it. They also benefit for opportunities to imitate the word before producing it independently. Since mathematical concepts are interconnected, learning about relationships between concepts and applications of concepts can take place in multiple contexts.” (Kindergarten Program, 2016 pages 83-84).

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Pop in...

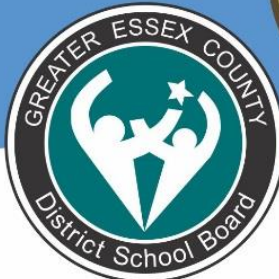
Model appropriate language for a moment or two...

- OWL: observe, wait and listen.
- Be at the child's physical level.
- Think aloud. "I wonder which structure is taller? If I put them side by side I can see the blue one is taller."
- Notice and name your actions. "I am cutting the apple up into several pieces."
- Notice and name the child's actions. "You are using a hammer to pound the tiny nails."
- Comment. "The car is going through the tunnel."



...Pop Out

Join in and engage in another play group or centre.



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Vocabulary Strategies

Shared Reading

Reading a storybook in a way that actively involves children in dialogue enhances overall language and literacy development. Children's literature provides context for children to experience and understand the meaning of words. The reading requires explanations and explicit discussion of new word meanings and uses. Some examples of books that contain numerous relational concepts and content specific vocabulary are as follows:

- Which is Round? Which is Bigger? By M. Marmada (2013)
- Piggies in the Pumpkin Patch by M. Peterson & J. Rote (2010)
- Rosie's Walk by P. Hutchins (1971)
- Shrinking Mouse by P. Hutchins (1997)
- Big Bug by H.Cole (2014)
- You Are (Not) Small by A.Kang & C. Weyant (2014)
- Elephants Aloft by K. Appelt (1993)
- Carry Me: Animal Babies on the Move by S.Stockdale (2008)
- Caps for Sale by E. Slobodkina (1940)
- The Snowy Day by E. J. Keats (1962)
- Harold and the Purple Crayon by C. Johnson (1955)
- Olivia by I. Falconer (2000)
- Scaredy Squirrel by Melanie Watt (2006)
- Sharks Big Bigger Biggest by J. Pallotta (2005)
- The Crayon Counting Book by J. Pallotta (1996)
- The Icky Bug Counting Book by J. Pallotta (1989)
- Twizzlers Shapes and Patterns by J. Pallotta (2002)

Using student friendly definitions (e.g., explaining meanings in everyday language that are easy to understand) are recommended for cross-curricular concepts and verbs as they promote comprehension and retention. Dictionary-style definitions are often difficult for students to understand and use in conversations and classroom learning opportunities (e.g., *Sort* - If you *sort* items, you put them in a certain order or plan them in a certain way. *Match* - If you *match* things, you pair up two things that are alike in some way).

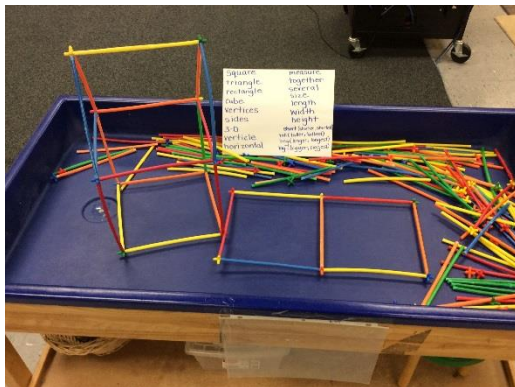
When pre-teaching vocabulary:

- Say the word (e.g., "*list*")
- Have the students repeat the word
- If the word is found in a read aloud, reference it (e.g., In "*Scaredy Squirrel*" he *lists* things that frighten him as well lists of things in a first aid kit).
- Explain the meaning with a student-friendly definition (e.g., If you *list* things, you write them down or say them one after the other).
- Give a personal connection (Mrs. S. *lists* all the friends who are away from school today).
- Have the students offer a personal connection (Students will share lists they have made or people they know).
- Have the students repeat the word again

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Word Banks

- Choose relevant words from the vocabulary list. Post them around the room to remind adults to use them. Use language facilitation techniques while “popping in – popping out” across the day
- Demonstrate and/or contrast meanings using manipulatives, objects, pictures, actions, or events in the classroom (indoor and outdoor)
- Facilitate generalization of new concepts by having students use the terms to label and compare a variety of objects or events
- Review basic concepts and relational terms often



Parent Connections

Establish a parent connection (e.g., agenda notes, daily calendar activities, blog, tweet, remind, etc.). Send the words home. If possible, translate the words into students' home languages so they can discuss the vocabulary with their families.

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Math Vocabulary Across the Day Using Pop In... Pop Out

Centre: Dramatic Play-Grocery Store

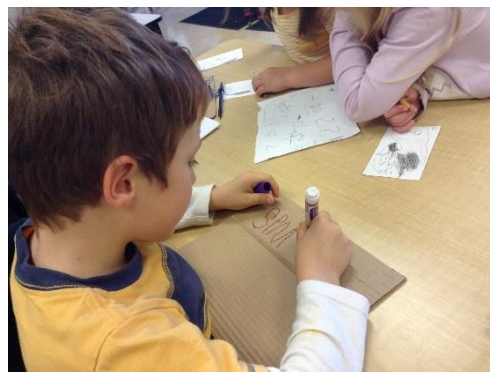
Introduction of New Vocabulary:

- 1) Include money, a scale, and products.
- 2) Post vocabulary at cash register, at the scale and in the 'aisles' for adults to use.
- 3) Think aloud, notice and name, and comment using the posted vocabulary.
- 4) Discuss various roles that students could play to contribute to the grocery store (e.g., customer, employee, baker, butcher or cashiers) and how math might be considered in their role (e.g., measuring for baking, thickness of meat, size of bags and/or boxes).

Possible Vocabulary to Consider: count, coin, money, dollars, heavier, heaviest, heavy, lighter, lightest, large, larger, light, lighter, lightest, large, larger, small, smaller

Example of Possible Consolidation: During whole group learning, have students share what they found while using the scale. Give prompts such as: when comparing the weight of oranges and apples, what did you find? Show me something that is lighter than a _____, show me something that is heavier than a _____.

Extension: Plan a trip to your local grocery store. Bring a vocabulary list and have students check off/draw/write/represent what they see (e.g. something large, something small, something heavier than an orange, something lighter than a box of cereal, write a price that you see, etc.). Use this trip to introduce vocabulary in real life context and then come back to school and plan your centre together.



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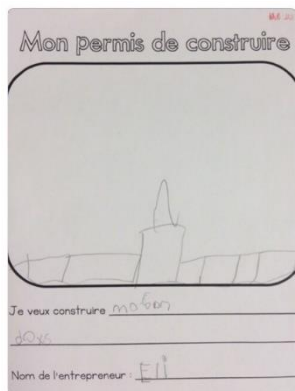
Centre: Building/Construction

Introduction of New Vocabulary:

- 1) Introduce shapes: names and attribute words
- 2) Introduce procedural vocabulary- first, then, next and include examples using ordinal numbers. The first step was..., the second step was..., etc.
- 3) Introduce positional vocabulary.
- 4) Post vocabulary at the centre for adults to use while popping in.
- 5) Think aloud, notice and name, and comment using the posted vocabulary.
- 6) Use big blocks, little blocks, recycled materials (boxes, paper towel roles, etc.) and/or 3-dimensional shapes from your math kit.

Possible Vocabulary to Consider: above, add, after, alike, before, beginning, behind, below, beneath, beside, between, big, biggest, bigger than, bottom, circle, count, create, cube, curve, cylinder, edge, ordinal numbers (first, second, third, etc.), flat, next, next to, middle, oval, prism, pyramid, rectangle, shape, sphere, square, etc.

Example of Possible Consolidation: Have students share their structure (either a picture or the actual structure). Encourage them to discuss the shapes that they used and the position in which they placed them. Alternatively, students can use a planning sheet to detail the steps they took in creating their structure. For example: "First I made the house, then I added a garage, finally we played in it."



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Centre: Water Table

Introduction of New Vocabulary:

1. Include various-sized containers
2. Post vocabulary at the centre for adults to use while popping in.
3. Think aloud, notice and name, and comment using the posted vocabulary.
4. Develop daily questions to guide student exploration (e.g. “Which container holds the most water?”, “Can you find two containers that hold equal amounts of water?”, “How many spoonfuls of water does it take to fill your container?”)

Possible Vocabulary to Consider: add, take away, compare, empty, even, equal, measure, same, more, less, volume, full, least, most, number names.

Example of Possible Consolidation: Document and have students share their answers to the questions posted. Students may use different materials and may have different findings.



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Template

Centre:

Introduction of New Vocabulary:

Vocabulary to Post:

Consolidation:

Extension:

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