

DIFFERENTIATION & NEURODIVERGENT LEARNERS

Calgary City Teachers' Convention 2026



mathimaginefoundation.ca



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INTRODUCTION: Carly Abraham

High School Mathematics Teacher

Taught for 15+ years

Teach at North Trail High School for the CBE

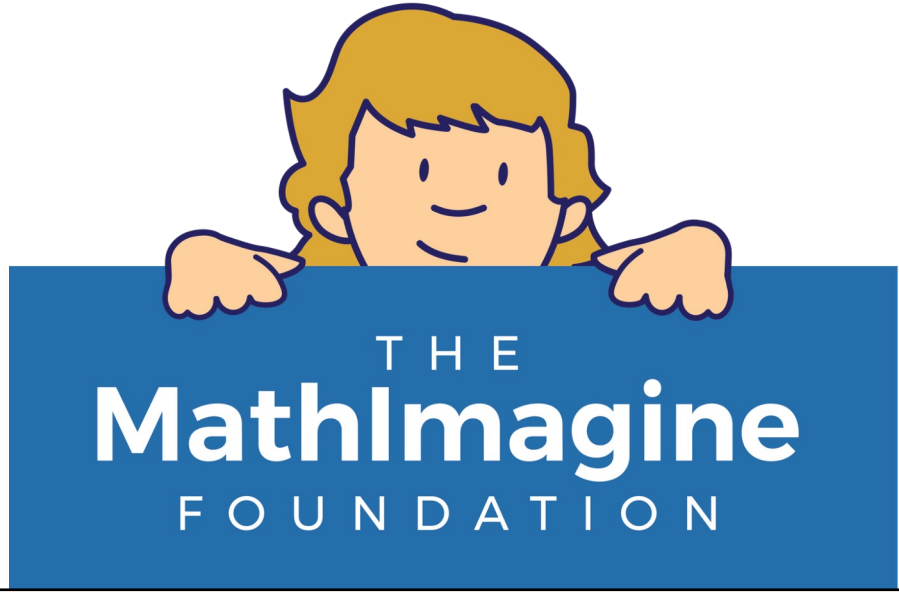
Worked for MathImagine, presented many sessions

Assisted teaching and taught math at all levels

Presenting on behalf of the MathImagine Foundation

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ABOUT US



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ABOUT CELIA

FOUNDER OF MATHIMAGINE

- Mathematics educator
- Creator of mathematics resources
- Founder of MathImagine



CELIA BARON

M.Sc. Mathematics

M.Sc. Mathematics Education

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SESSION AGENDA

- 01 Introduction
- 02 What is Differentiation
- 03 Effective Strategies
- 04 Summary/Take Aways



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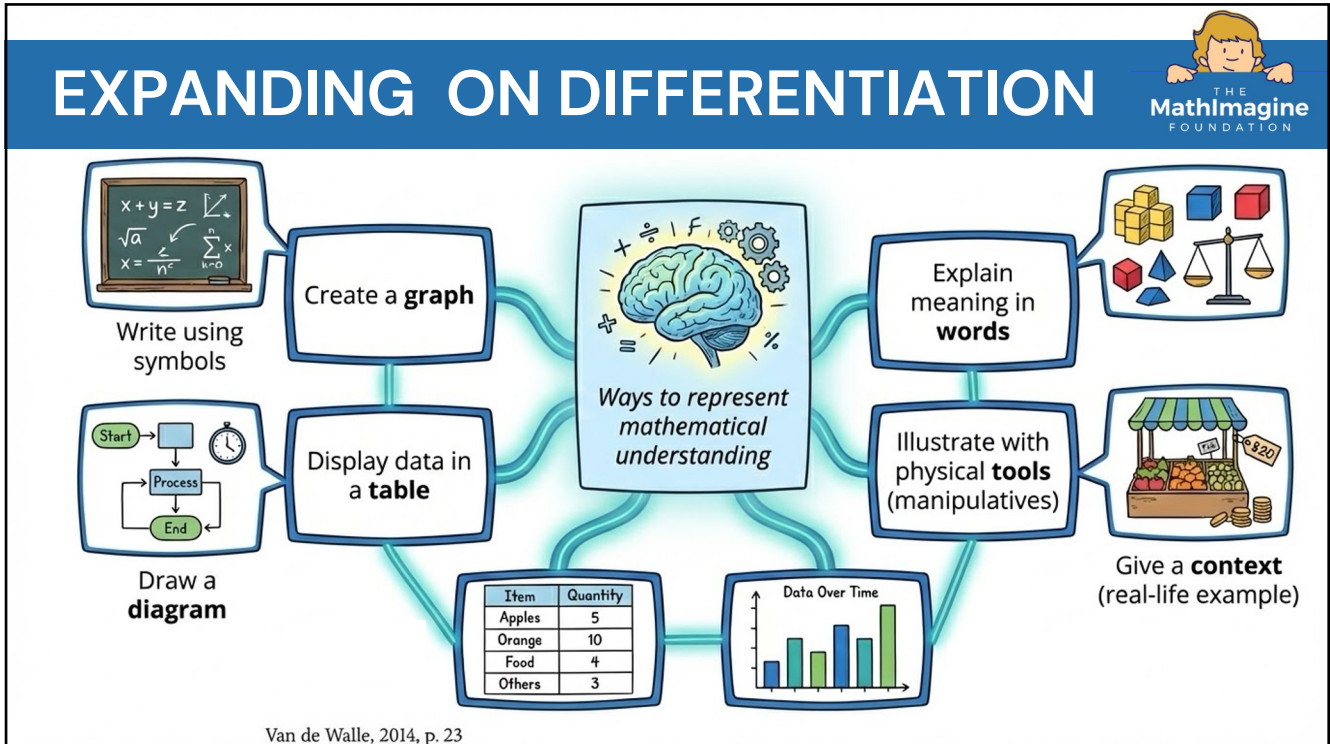
WHAT IS DIFFERENTIATION?



Differentiation is an ***instructional approach*** that requires a shift from focusing on the “middle-of-the-road” child to attending to ***all children***. As overwhelming as this may sound, differentiation does not require a teacher to create individualized lessons for each and every child in the classroom.

(Van de Walle, Lovin, Karp & Bay-Williams, 2013)

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THE MathImagine FOUNDATION

Practical Examples of Differentiation Activities With a Class


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CONCRETE > PICTORIAL > ABSTRACT




Concrete Representation

the 'doing' stage
a child is first introduced to an idea or a skill by acting it out with real objects



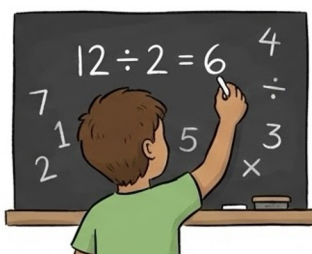
Pictorial Representation

the 'seeing' stage
a child can now relate and represent ideas and concepts using diagrams, sketches, or pictures




Abstract Representation

the 'symbolic' stage
a child is now capable of representing problems by using mathematical notation




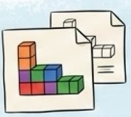
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MANIPULATIVES



Concrete > Pictorial > Symbolic

Anytime a concept is new, regardless of the ages of the students, manipulatives can help make the concept visual, concrete, and connected to other ideas.



→

→

$$x - 2^2 = 3 + 10$$

$$4 + 2 + 7 = ?$$

$$3 - 5 = ? = x ?$$

(Van de Walle, Karp, Lovin, Bay-Williams)



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PARALLEL TASKS



Traditional Question

Choice 1: 45 students each paid \$3 to go to the fair. How much money was collected in all?

Choice 2: 4 students each paid \$3 to go to the fair. How much money was collected in all?

Choice 3: 45 students each paid \$13 to go to the fair. How much money was collected in all?

Open Question

Choice 1: $[] \times [] = 480$.
How many pairs of numbers can use use to fill in the blanks? What are they?

Choice 2: $[] \times [] = 24$.
How many pairs of numbers can use use to fill in the blanks? What are they?

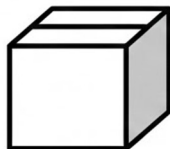
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OPEN TASKS



Traditional Question

To which fact family does $3 \times 4 = 12$ belong?



Open Question

Describe the picture by using a mathematical equation.

X	X	X
	X	
X	X	X
	X	
X	X	X
	X	



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OPEN TASKS



What do you know about 35%?

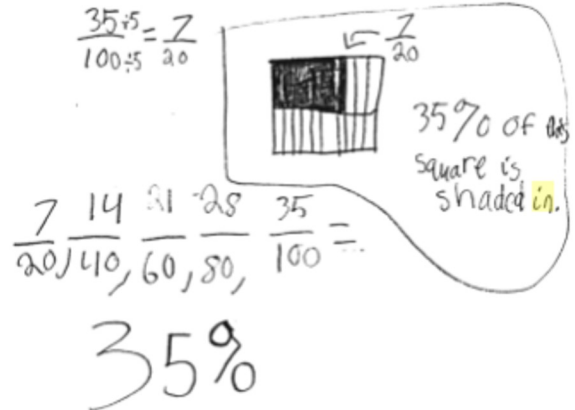
$$35\% = .35$$

$$35\% = \frac{35}{100}$$

$$\frac{35}{100} = .35$$

35% is close to $\frac{1}{3}$.

$$\frac{35 \div 5}{100 \div 5} = \frac{7}{20}$$

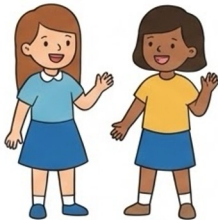


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FLEXIBLE GROUPINGS



- Implement varied group sizes (pairs, small groups, whole class)
- Encourage student choice in group formation for comfort
- Rotate groups to build social skills and peer relationships



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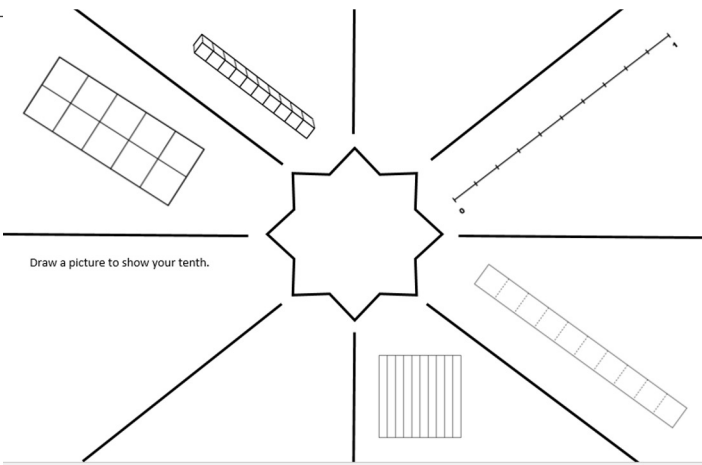
CHOICE

Word Problem

By: _____

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

Draw a picture to show your tenth.





Different Areas of Differentiation



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Content

- concept is consistent
- adjust the complexity and connections to other topics

Examples:

- parallel tasks
- open questions (low floor, high ceiling)
- activities that meet learners where they are (Cross-Number Puzzles, Thinking Strategies)

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Process

→ How students engage with and make sense of the concept

Examples:

- manipulatives (eg cuisenaire, beadstrings)
- on their own or collaboratively
- paper and pencil
- white boards
- digital

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Product

→ How children show their learning

→ how will you assess

Examples:

- formative
- summative
- pictures, words, symbols, manipulatives, tech etc.

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Learning Environment

→ The physical environment supports learners

Examples:

- manipulatives
- on their own or collaboratively
- teaching space
- standing

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Attending to All Learners

Content

→ Concept is consistent, adjust the complexity and connections to other topics

Process

→ Adjust how students will engage with and make sense of the concept

Product

→ Variety in the form through which children show their learning.

Learning Environment

→ The physical environment supports learners.



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DISCUSSION



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Content

Neurodivergent Student Groups

Process

- Dyslexia
- Dyscalculia
- Dysgraphia
- ADHD
- Anxiety Disorders
- Sensory Processing Disorder
- Gifted
- Autism

Product

Learning Environment

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LET'S GO THROUGH THE LIST


- Dyslexia
- Dyscalculia
- Dysgraphia
- ADHD
- Anxiety Disorders
- Sensory Processing Disorder
- Gifted
- Autism

WHERE CAN WE DIFFERENTIATE? 

CONTENT	PROCESS
PRODUCT	ENVIRONMENT

also

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Learning Strategies

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GUIDING QUESTIONS



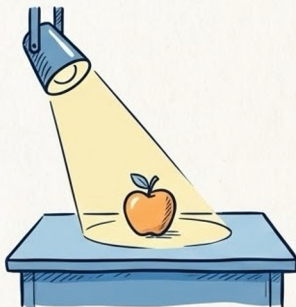
What are the organizational, behavioral, and cognitive skills that are necessary for the students with disabilities to drive meaning from this activity?

Which students have known weaknesses in any of these skills or concepts?

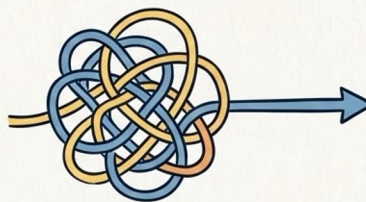
How can I provide additional support in these areas of weakness so that students learning disabilities can focus on the conceptual task in the activity?

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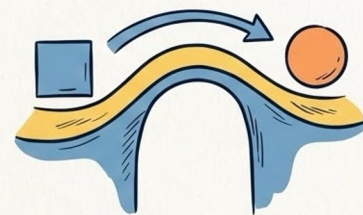
1. STRUCTURE THE ENVIRONMENT



Centralize Attention




Avoid Confusion


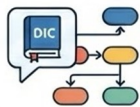





Smooth Transitions


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


2. IDENTIFY/REMOVE POTENTIAL BARRIERS

- Find ways to help students remember. 
- Provide vocabulary and concept support. 
- Use friendly numbers. 
- Vary The task size. 
- Adjust the visual display. 


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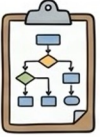



Remember:

<h3 style="margin: 0;">ENVIRONMENT & PROCESS</h3> <ul style="list-style-type: none"> • Centralize Attention  • Avoid Confusion  • Smooth Transitions  	<h3 style="margin: 0;">COGNITIVE SUPPORT & TASK ADJUSTMENTS</h3> <ul style="list-style-type: none">  Find ways to help students remember.  Provide vocabulary and concept support.  Use friendly numbers.  Vary The task size.  Adjust the visual display.
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3. PROVIDE CLARITY

 <p>Reiterate, the timeframe</p>	 <p>Emphasize the relevant points.</p>
 <p>Ask students to share their thinking.</p>	 <p>Use methods for organizing written work.</p>
 <p>Emphasize connections.</p>	 <p>Provide examples and non-examples.</p>
 <p>Adapt delivery modes.</p>	

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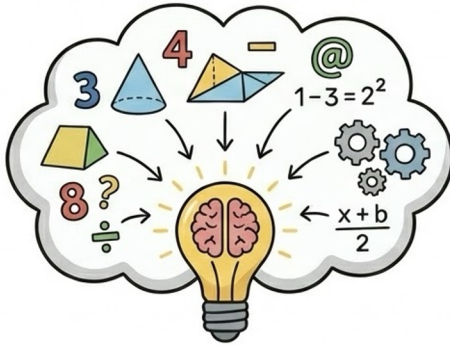


4. CONSIDER ALTERNATIVE ASSESSMENTS

 <p>Propose alternative products.</p>	 <p>Encourage self monitoring and self assessment.</p>	 <p>Consider feedback charts.</p>
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5. EMPHASIZE PRACTICE AND SUMMARY



Help students bring ideas together.



Provide extra practice.

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STRUCTURE THE PROCESS



- Reiterate timeframe.
- Adapt delivery modes.
- Provide written instructions.
- Use methods for organizing written work.

FACILITATE SHARING



- Ask students to share thinking.
- Emphasize connections.
- Help students bring ideas together.

PROVIDE SUPPORT & FEEDBACK



- Emphasize relevant points.
- Provide examples and non-examples.
- Consider feedback charts.
- Provide extra practice.

ENCOURAGE OWNERSHIP



- Propose alternative products.
- Encourage self monitoring and self assessment.

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STRATEGIES TO AVOID



MORE OF THE SAME WORK



FREE TIME FOR FINISHERS



GIFTED AS HELPERS



ADDITIONAL OPPORTUNITIES



INDEPENDENT COMPUTER ENRICHMENT



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STRATEGIES FOR STUDENTS



Technology Use



Extra Time



Flexible Submissions



Visual Aids



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STRATEGIES FOR STUDENTS

Break Down Tasks

Divide complex assignments into smaller, sequential steps.

Clear Directions

Provide explicit, step-by-step instructions, both written and verbal.

Organizational Tools

Teach the use of planners, folders, and digital organizers.

Clutter-Free Spaces

Maintain a tidy workspace to minimize distractions.

Movement Opportunities

Incorporate short physical activity breaks to improve focus.

Headphone Use

Allow headphones for focus or to filter out background noise.

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WRAP UP

Importance of Differentiation

Understanding diverse learner needs.

Strategies for Success

Effective tools and methods.

Empowerment and Growth

Fostering student confidence.

Continuous Improvement

Ongoing refinement and learning.

Call to Action

Implementing change today.

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Citations

Apanasionok, M. M. (2021). Teaching early numeracy and science to students with developmental disabilities [Master's thesis, University of Warwick]. Warwick Research Archive Portal.

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Asbell-Clarke, J. (2023). Reaching and teaching neurodivergent learners in STEM: Strategies for embracing uniquely talented problem solvers. Routledge.

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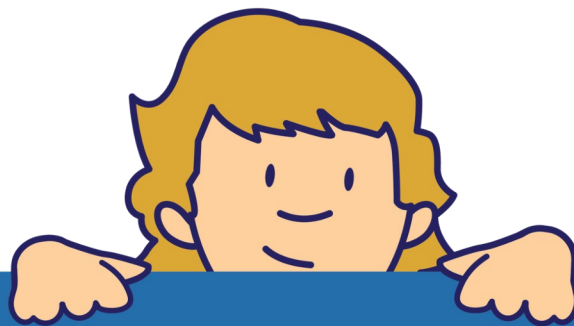
Crawford, A. R., & Kernin, A. (Year). *Mathematics instruction and mathematical vocabulary: Engaging a neurodivergent student*. Boise State University.

Norell, L. (2024). Supporting neurodivergent students with dyslexia, dyscalculia, dysgraphia, and dyspraxia. University of Mississippi. https://egrove.olemiss.edu/cgi/viewcontent.cgi?article=1127&context=cetl_events

Van de Walle, John A. Teaching Student-Centered Mathematics. Developmentally Appropriate Instruction for Grades Pre-K--2. Boston :Pearson, 2014

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WIND DOWN



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ADDITIONAL SESSIONS

Preschool and Kindergarten:

- Numeracy and Young Learners: A Developmental Affair
- Top 10 Numeracy Activities for Preschool/Kindergarten

Games:

- Math Games Galore: Having Fun with Math (K-3)
- Math Games Galore: Having fun with Math (3-6)

Math Intervention:

- Math Intervention Made Easy with Cross-Number Puzzles (K-6)

Basic Facts:

- Building Mastery of Basic Facts (K-6)
- Success with Addition and Subtraction Facts (1-3)
- Success with Multiplication and Division Facts (3-6)
- Basic Facts Mastery for Junior High Without a Calculator (7-9)

Manipulatives:

- Modelmania: Ten-frames, Number lines, Arrays and More (K-6)
- Strings + Beads + Numeracy = Amazing Resource (K-6)
- Numeracy with Cuisenaire Rods (K-6)

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RESOURCES

01 Thinking Strategies

The Thinking Strategies program provides comprehensive strategies for teaching basic factors. It is uniquely organized with levels based on the ease of learning facts rather than numerical order.

02 Cross-Number

In Cross-Number, each question is linked to a specific outcome from the Instructional Framework of Numbers. This enables educators to quickly determine which outcomes the child knows and which are still being developed.

“For a teacher, there is no greater experience than that incredible moment when a student just ‘gets it’ – that ‘a-ha’ moment when you know that you’ve made a difference.”

-Celia Baron

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THANK YOU

FOR ATTENDING

$\square \times 2 =$

$2 \times \square = 6$

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