Supporting Students Who Are Behind in Math

Why is Equitable Math Instruction Important?

- Many people grow up with the belief that they will never be good at math.
- We see the implications of this reflected many places, from the decreasing number of people in STEM fields, to the every day struggle of the person who nervously counts their money for the cashier (Maloney & Beilock, 2015).
- We believe that equitable math instruction can help reduce these negative outcomes.

What are the Repercussions of Inequity in the Math Classroom?

Math Anxiety

•Children as young as first grade experience math anxiety (Maloney & Beilock, 2012).

•Mental effort and resources are devoted to worrying about math, rather than doing it (Beilock & Maloney, 2015).

Negative Cycle

•Negative experiences with math in which students feel left behind and/or unable to achieve can potentially lead to avoidance and enhanced math anxiety.

•Without interruption of this cycle, students can find themselves on a negative trajectory moving away from rich mathematical learning.

Creating an Environment Where Everyone Can Thrive

Growth Mindset

Dweck, 2006

•Growth Mindset reflects the belief that one's skills and abilities can be cultivated through effort, with their basic qualities as a starting point.

•Teacher modelling can help to develop this perspective in students as well (Finlayson, 2014).

Thinking Classrooms

Liljedahl, 2015

•Knowledge is co-constructed amongst students, as well as students and teacher.

•Visibly random groupings help to promote a knowledge sharing culture.

•Vertical, non-permanent workspaces mean students get started faster, and may feel less pressure to "get it right".

•Teacher answers and encourages "keep thinking questions".

Group Work

Ghousseini et al. 2017

•Increases success with mathematics as there is immediate help from peers (Finlayson, 2014).

•Proper scaffolding is important so students stay on task, and everyone contributes.

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April 5, 2018

Cultivating Students' Self-Efficacy Through Math Problems.

- Engage students using problems that have multiple entry points (Krpan, 2018).
- Promote and encourage student awareness of connections between math and their everyday lives (Kalchman, 2011; Sherman et al., 2009).
- Teach and make time for students to practice mental math strategies, leading to increased confidence and fluency (Olsen, 2015).

EXAMPLE ACTIVITIES

Primary

Students are given open ended questions to answer that can be solved in multiple ways. For example:

1. In a candy jar, 1/2 of the candy is red. What might this look like?

2. The answer is 10 teddy bears. What is the problem?

By using open ended problems, all students can access the same question at their own level. As students' skills improve, the open-ended questions can reflect this growth. For example, extending question 1 could be:

3. In a candy jar, 1/3 of the candy is red, and 1/3 of the candy is blue, what might this look like?

These types of open ended problems grow with the student's mathematical skills.

Retrieved from Learning Sprouts & Cathy's Corner

CURRICULUM

1. Mathematics process expectations: apply developing problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding (OME, p.32).

2. Communicate mathematical thinking orally, visually, and in writing, using everyday language, a developing mathematical vocabulary, and a variety of representations (OME, p.32).

Junior

Students experiment with broad, open-ended questions inspired by Fermi's problems (Taggart et al., 2007). These sorts of questions may initially seem impossible to solve, but students can indeed come up with a well-reasoned solution. For example:

1. How far will you walk in a year?

2.How many pet dogs are there in Toronto?

We also like the open-ended questions depicted by Marian Small (2015). For example: *When might you start with four bills and three coins, trade for bills and coins of equal value, and end up with six bills and seven coins?*

These questions have a low floor and high ceiling and can be answered "correctly" in multiple ways. They allow students to draw upon their knowledge of different mathematical processes and strategies and encourage collaboration and knowledge sharing.

CURRICULUM

Students get to develop their communication and problem-solving skills, as depicted in the four-step problem solving model (Ontario Ministry of Education, 2005, p. 11-14) in order to communicate a convincing solution to share with their classmates and teacher (p. 17).

Depending on the strategies used, students can apply fundamental Ontario curriculum concepts from the grade four, five, and six expectations, related to measurement, number sense and numeration, and/or data management and probability.