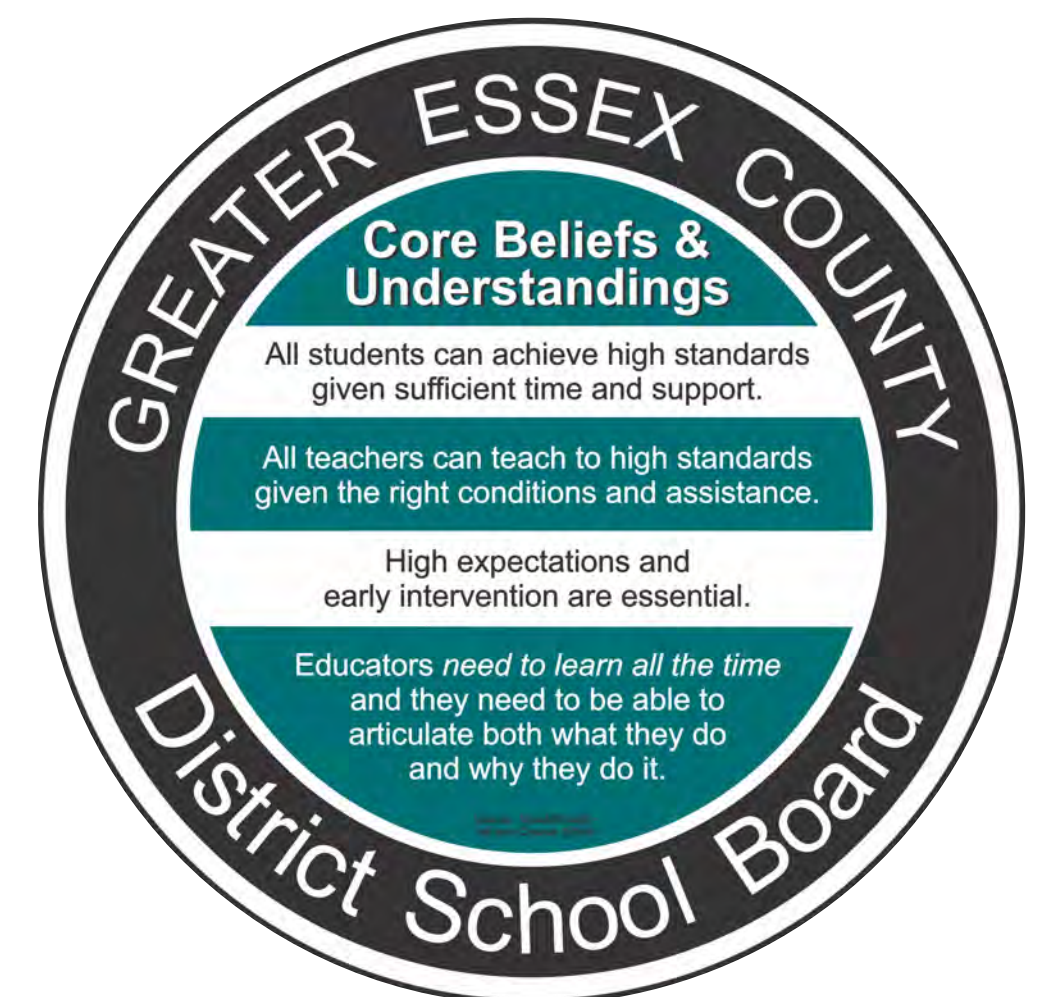


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Small Group Instruction For Targeted Mathematics Intervention

Within the literacy block, small group instruction has become a strategy that consistently allows teachers to meet the learning needs of their students. In schools across Ontario, it is a regular practice that students participate in small group instruction to foster the development of their reading and writing skills. Research suggests that individualized and differentiated instruction is a high yield strategy to meet the needs of diverse learners within the classroom and it is a widely accepted approach for early literacy intervention. Assessment plays a key role in delivering effective small group instruction. Knowing the entry point of each student allows teachers to make informed decisions about instructional moves to best address student learning need. Diagnostic and formative assessment equips teachers with the necessary information to maximize their small group time and alleviates much of the guesswork. Every minute of individualized instructional time with students is valuable; being informed helps teachers maximize their impact as they select “just right” and differentiated intervention strategies. Belief around the impact and necessity of small group instruction in literacy is undisputed. However, surprisingly, this instructional strategy has been slow to transfer as a norm within the mathematics classroom.

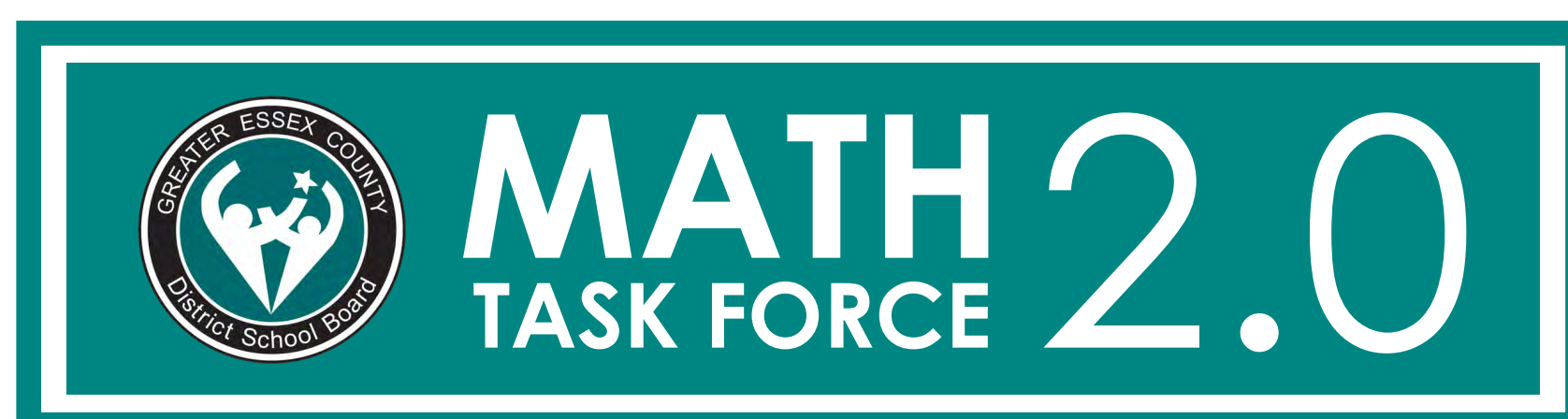


“The Greater Essex County District School Board provides mathematics education that engages and empowers students through collaboration, communication, inquiry, critical thinking, and problem-solving, to support each student’s learning and nurture a positive attitude towards mathematics.”

GECD SB, A Vision for Mathematics, 2016

The purpose of these learning briefs is to share the research, discussion, and insights garnered from the intensive work of the Greater Essex County District School Board’s Math Task Force. These papers are rooted in the GECD SB core beliefs and in Ontario Ministry of Education documents as well as the Ontario Mathematics Curriculum (2005). They are meant to elevate, enrich and extend the discourse of mathematics education with the intention of encouraging a positive and productive disposition toward mathematics.

Each paper provides a list of sources and resources to extend the professional conversation, and enhance the learning. In addition, live links appear at the end of each paper, with connections to various resources.



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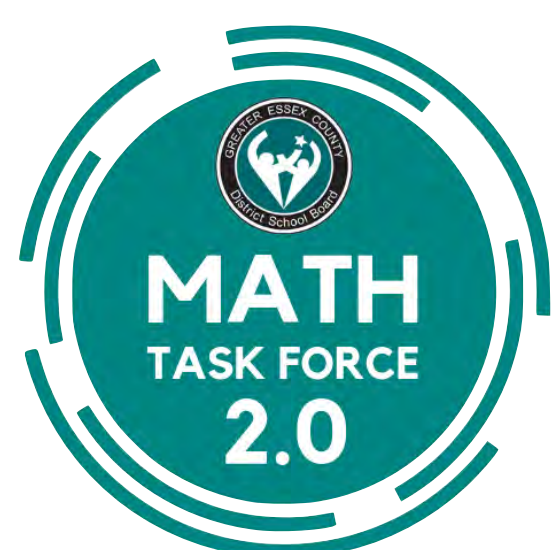


SMALL GROUP INSTRUCTION: A NECESSARY COMPONENT OF EFFECTIVE MATHEMATICS INSTRUCTION

Building upon on our experience in literacy, the foundational components, structures, and belief around the effects of small group instruction have already been established. Researchers have begun to investigate mirroring this instructional approach in mathematics and monitoring the impact of small group instruction on mathematics development. “Small group reading instruction is ubiquitous in elementary schools. This type of intervention provides the opportunity for more tailored, individualized instruction, which may help to motivate as well as instruct students. It also provides greater opportunities for conversation and interaction among teachers and students. Prior research has demonstrated the efficacy of this approach for improving students’ early literacy skills, yet small group instruction is used much less frequently for math” (Jacob et al. 2018).

The opportunity afforded by small group instruction in the math classroom is an additional opportunity to reach every student. “Guided math enhances student learning as lessons are designed for the learner and what the student needs at that moment in time” (Ontario Teacher’s Federation, 2019.) It is also an opportunity to speak with students one on one in order to develop a better understanding of their mathematical thinking and to value their ideas. Mathematics researcher, Marilyn Burns suggests that speaking with students one on one is the only way to see their “mathematical soul.” Through small group instruction, teachers can be responsive to student learning needs and create an environment that supports all students, but particularly those struggling in mathematics. “Educational research literature on the subject of supporting students who are struggling in mathematics suggests the need for differentiating instruction through individualization of content and strategies, conceptually based explicit instruction and questioning, visual representations, meaningful practice, scaffolding and math discussions.” (Ball, S. et al., 2016)

“Guided math enhances student learning as lessons are designed for the learner and what the student needs at that moment in time”
(Ontario Teacher’s Federation, 2019).



ASSESSMENT DRIVES INSTRUCTION

At the core of small group instruction is the teacher’s ability to differentiate for students based on their developmental readiness. In order to determine each student’s entry point, diagnostic assessment is a key component to delivering effective remediation and targeted intervention through small group instruction. “One (purpose of a diagnostic assessment) is to provide the teacher with clarity regarding students’ prior or prerequisite knowledge related to content that the upcoming learning segment is going to build upon. Assessing for prior knowledge can identify student misconceptions as well as gaps in knowledge and skills that a teacher might assume students of a particular grade level have already mastered” (Tomlinson et al. 2013). Effective diagnostic assessment should be used to determine an individualized path to address student-learning needs or to extend student thinking. “The teacher who consciously uses assessment to support learning takes in this information, analyzes it, and makes instructional decisions that address the understandings and misunderstandings that these assessments reveal” (Leahy et al. 2005, 19).

INVESTIGATING THE IMPACT OF SMALL GROUP INSTRUCTION IN MATHEMATICS THROUGH THE GECDSB SUMMER LEARNING PROGRAM

During the 2018 GECDSB Summer Learning Program (SLP), research was conducted to measure the impact of intentional and targeted small group instruction on student achievement in mathematics. 784 children participated in Summer Learning across a variety of programs and camps, which included 29 combined literacy and numeracy sites.

A core component of the Summer Learning Program is daily small group instruction in both literacy and numeracy. At the onset of the program, educators used Leaps and Bounds as a diagnostic assessment tool. “The resource is designed to assist teachers in providing precise, targeted remediation for these students (struggling in mathematics) – individually, in small groups, or as a whole class. With Leaps and Bounds, teachers can help students better understand the

prerequisite math so they can be successful in meeting the curriculum requirements for their grade. (Ball, S. et al., 2016) Primary students participating in the program were assessed in the content areas of counting, addition and subtraction. Sitting with students one on one in order to conduct the interviews gave educators insight into what students could do and helped educators identify students' individual next steps. Teachers used the diagnostic assessment and insight gained from the interviews to develop a plan for targeted remediation, equipping them with valuable information about the individual needs of their learners.

SUMMER LEARNING PROGRAM (SLP) CASE STUDY: IDENTIFIED STUDENT LEARNING NEEDS AND RELATED TEACHER ACTIONS

At a summer learning site, a grade 2 student was interviewed using the grade 1/2 Leaps and Bounds assessment which assesses gaps in prior knowledge related to the K-1 curriculum. As the educator asked a series of questions related to counting, the student demonstrated the ability to rote count by ones to 20. He also counted by groups of twos to ten and counted by 5s to 20. He was unable to conceptually subitize numbers larger than 5, instead he relied on his one to one counting skills. He struggled to count backwards by any unit with accuracy. For example, "pick a number from 5 to 15, count backwards to 0 from your number."

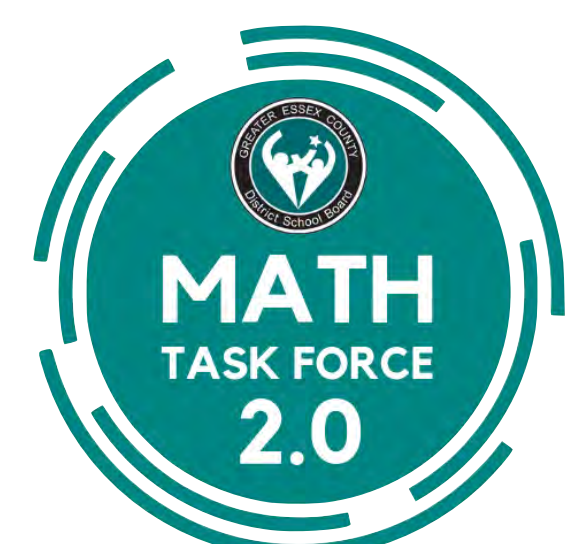
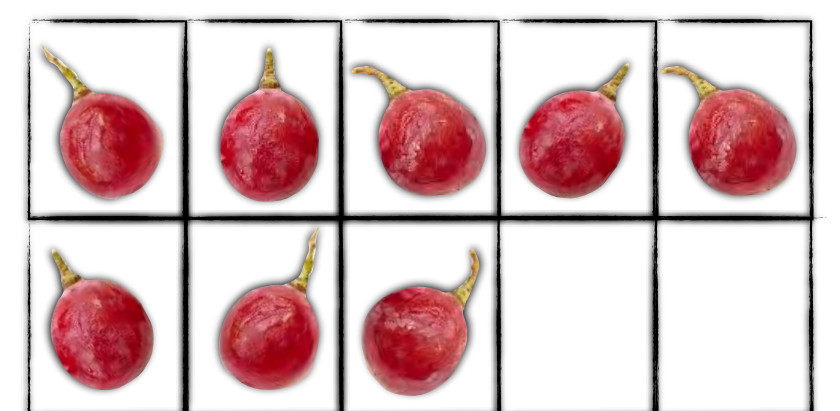
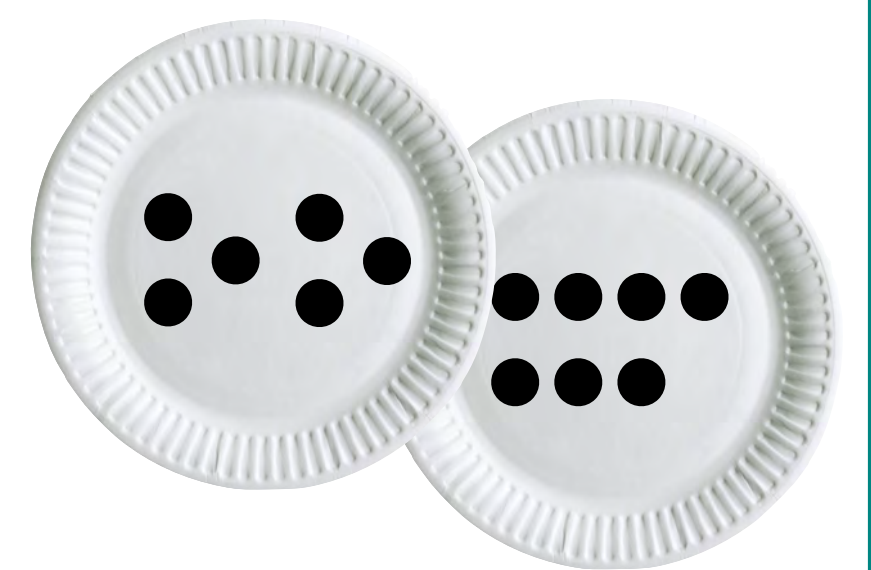
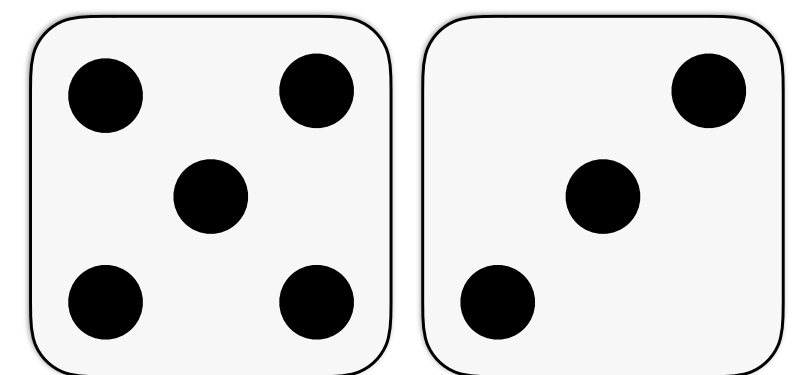
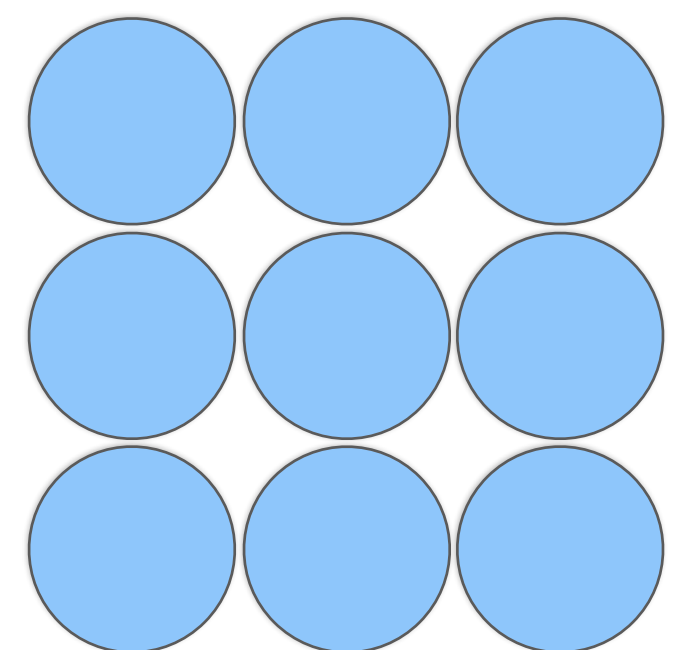
When it came to addition and subtraction, the student did not independently demonstrate any thinking strategies. He often randomly guessed a sum or difference. With some prompting, he was able to use his fingers or the visual prompts to find small sums using one to one counting. Of the 13 addition questions, the student answered 5 questions correctly. Through the subtraction questions, it was evident that the student did not understand the concept of subtraction, even in context. For example, when asked to determine whether there were enough bones for the number of dogs, he could not demonstrate the ability to match the dogs and bones one to one in order to determine the difference. The student's

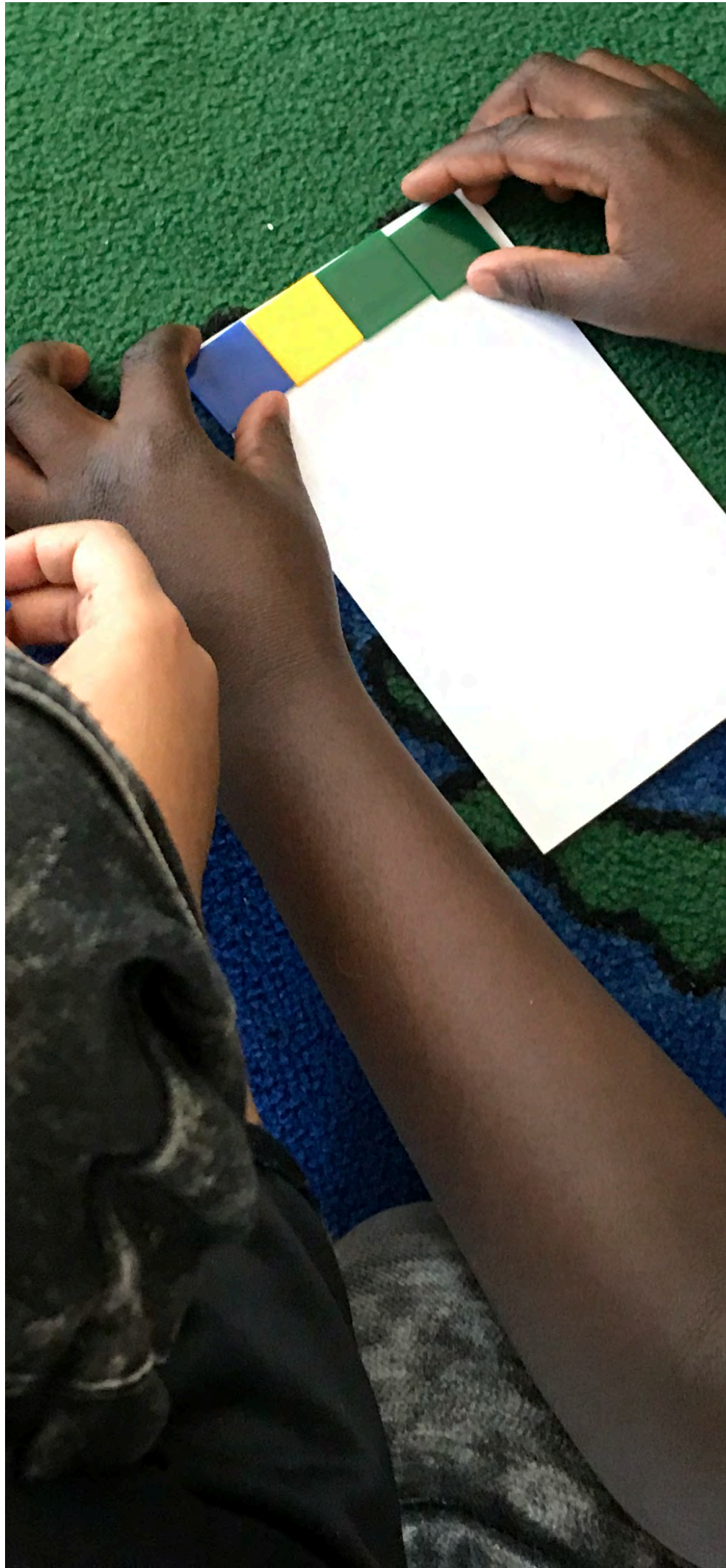
inability to count backwards also presented a challenge for successfully answering the subtraction problems. For example, "put 17 cubes on the 10 frame, take away 1 at a time and count backwards". Of the 13 questions in the subtraction portion of the assessment, the student answered two questions correctly.

Equipped with this information through the Leaps and Bounds assessments, the teacher was able to create a targeted intervention plan based on the student learning needs which was facilitated daily over the course of 3 weeks. The educator developed a plan to target conceptual subitizing through the use of dot plates, ten frames and the arithmetic rack. The student practiced counting backwards by units of 1, 2 and 5 from 20 to 0 daily using the arithmetic rack and a number line. The teacher also focused time during small group instruction with this student on the "part-part whole" model to make sense of different contexts related to the operations of addition and subtraction. The teacher encouraged the student to model all contexts using concrete materials on the part-part whole mat. The student also worked on finding the difference in comparison subtraction problems using a concrete linear model. On the post assessment, the student demonstrated a variety of strategies and independently used models including the ten frame, the part-part whole mat and a concrete linear model as tools for thinking. The post assessment data for this particular grade 2 student is recorded in the table below.

ASSESSMENT TOOL	PRE	POST
Counting	8/13	13/13
Addition	5/13	12/13
Subtraction	2/13	11/13

Throughout the GECDSB Summer Learning Program, many of the students involved in the program demonstrated gains in the three main content areas. 70% of the students in the sample demonstrated improvement in counting. 75% of the students demonstrated improvement in addition and 90% of the students demonstrated improvement in subtraction.





The percentage of students scoring 80% or higher on each Leaps and Bounds assessment, gains that can be attributed to regular, focused, and targeted small group instruction based on diagnostic assessment are recorded in the table below.

ASSESSMENT TOOL	PRE	POST
Counting	50%	80%
Addition	65%	78%
Subtraction	20%	48%

Educators participating in the Summer Learning Program were asked to identify which factors they believe contributed to the gains measured through the pre and post assessments. The factors are ranked in the table below based on educator survey data.

1.	Co-Teacher/Educator Partnerships
2.	Consistent, precise, intentional small group instruction
3.	Use of diagnostic and formative assessment to monitor learning
4.	Use of available resources and manipulatives
5.	Inquiry approach
6.	Professional Development prior to Summer Learning Program



CONCLUSION

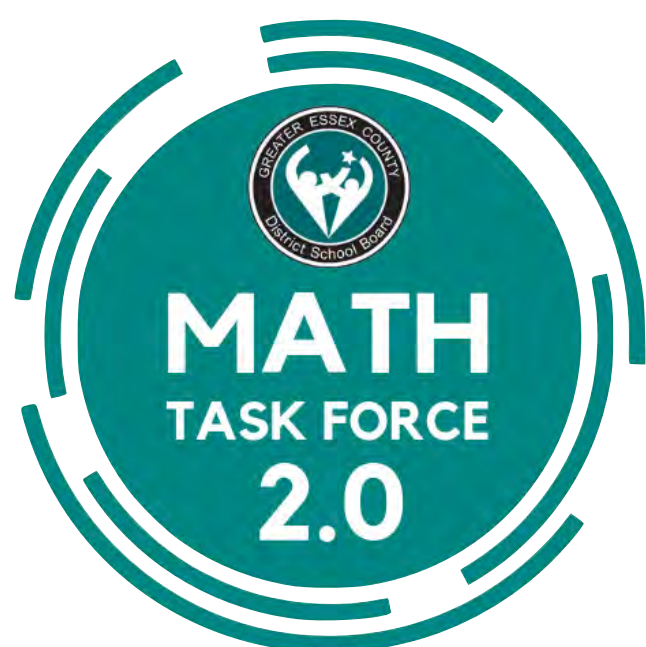
The GECD SB will continue to support the regular integration of assessment based small group instruction as an essential component of the mathematics learning block. It is the belief of the GECD SB that individualized and responsive intervention, delivered through meaningful small group instruction, is a mechanism for early intervention, remediation, and success for all learners.



Greater Essex County District School Board

451 Park Street West
P.O. Box 210
Windsor, ON
N9A 6K1

Phone: 519-255-3200
www.publicboard.ca



REFERENCES

Ball, S., Boland, T., Brouwer, P., McLoughlin, B., Michael Skrzypek, M. (2016) Leaps and bounds towards math understanding 1/2. Nelson. Toronto, ON. p. 2.

Jacob, R., Jacob, B. A. (June, 2018). New Evidence on the benefits of small group math instruction for young children. Brookings, Series: Evidence Speaks. Retrieved April 21st, 2019, from <https://www.brookings.edu/research/new-evidence-on-the-benefits-of-small-group-math-instruction-for-young-children/>

Leahy, S., Lyon, C., Thompson, M. and Wilia, D. (November, 2005). Classroom assessment: minute by minute, day by day. Assessment to Promote Learning: Education Leadership. Volume 63. p. 19-24. Retrieved April 21st, 2019 from <http://www.ascd.org/publications/educational-leadership/nov05/vol63/num03/Classroom-Assessment@-Minute-by-Minute,-Day-by-Day.aspx>

Moon, T. R., Tomlinson, C. A. (September, 2013). Assessment and student success in a differentiated classroom. ASCD. Alexandria, VA. p. 27

Ontario Teacher's Federation. (2019). Guided math through math workshop. Project reports. Retrieved April 18th, 2019 from <https://www.otffeo.on.ca/en/learning/tlc/report/guided-math-through-math-workshop/>