



Math Strategy Update

To: Program and School Services Committee

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Report No.: 02-23-4468

Strategic Directions

- Transform Student Learning
- Provide Equity of Access to Learning Opportunities for All Students
- Allocate Human and Financial Resources Strategically to Support Student Needs

Recommendation

It is recommended that the Math Strategy Update for 2022-23 be received.

Context

The Toronto District School Board (TDSB) is committed to providing mathematically rich, meaningful and inclusive learning opportunities for students to foster an appreciation of mathematics and develop students' identities as lifelong math learners. The TDSB Mathematics Action Plan (2019) achieves this goal by building capacity and content knowledge, ensuring coherence, differentiating assessment and instruction, challenging streaming and promoting inclusion, and engaging parents, families, and communities. The math strategy supports high-quality mathematics pedagogy through the TDSB's commitment to equity, inclusion and anti-oppression. It engages all students as math learners, including students with special education needs and students facing systemic barriers in their math learning, thus building a culture in schools where there is a high expectation that all students are capable math learners.

Action Plan and Associated Timeline

The TDSB's Multi-Year Strategic Plan (MYSP) identifies goals and actions that guide the system's work. Deep Learning in Mathematics aims to improve math education by building teacher and leader capacity through the School Improvement Process and using research-informed instructional and assessment practices. The plan aligns with the Ministry of Education's four-year Math Strategy by providing professional learning

opportunities for teachers implementing evidence-based instruction to develop the knowledge and pedagogy for better equipping students to succeed in math, applying high-impact instructional and assessment practices and Culturally Relevant and Responsive Pedagogy, digital math tools ensure opportunities for high-quality math supports are not limited to the classroom, subsidies for additional qualifications (AQ) math courses for teachers to further build confidence and skills in their mathematics teaching practice, school-based math coaches, and access to digital math tools and resources for educators and students, supporting professional learning in destreaming math courses (e.g., grade 9). These measures work towards improving student math performance and increasing students' capacity to solve everyday math problems and build skills to improve future employability. In addition, the TDSB has supported the implementation of the revised elementary math curriculum (2020), the Grade 9 de-streamed Math curriculum (2021), strengthened educator math content knowledge and pedagogy, increased awareness for parents, and provided students, parents, teachers, and leaders with the necessary support, tools, and resources to improve student learning and confidence in math. This report highlights a few of the system projects supporting rich learning taking place within schools.

Building Thinking Classrooms in Mathematics Through an Anti-Oppressive Lens: A System-Wide Collaborative Inquiry

Overview: Building Thinking Classrooms is a research-based framework developed by Dr. Peter Liljedahl (Simon Fraser University) that supports deep learning in mathematics. Thinking Classrooms involves students engaging in problem-solving tasks in small group math conversations at vertical non-permanent surfaces. The Ontario Ministry of Education has highlighted Thinking Classrooms as a [high-impact instructional practice in mathematics](#). This supports the math strategy by engaging teachers in using evidence-based and high impact strategies to develop the knowledge and pedagogy for better equipping students to succeed in math.

Participation and Timeline: From September 2022 to January 2023, Phase one included 59 elementary and secondary schools involving 280 classroom teachers, administrators, Middle Years Student Success Counselors, and K-12 Learning Coaches in a system-wide inquiry into Building Thinking Classrooms in mathematics through an anti-oppressive lens.

Next Steps: Approximately 350 additional teachers, administrators, and central staff from 110 elementary and secondary schools will participate in phase 2 from January

to May 2023.

Evidence of Impact: Participating teachers implemented the practices illustrated in professional learning (PL) sessions through an inquiry stance in their classrooms. A midpoint survey to participants showed that over **91% of respondents** reported that they were “sometimes to always” implementing the three core practices of Building Thinking Classrooms (providing thinking tasks, using vertical non-permanent surfaces, and creating visibly random groups). Participants and central staff have documented these promising student engagement practices and learning results.

Digital Math Tools

Overview: The Mathematics Department continues to implement district-wide access to various math tools to improve student math performance. The tools align with the Ontario math curriculum and support students in building foundational math skills and proficiency. These digital tools support the math strategy by ensuring opportunities for high-quality math support is available within and outside of the classroom.

- **Brainingcamp** (available system-wide): Brainingcamp is a suite of 17 powerful virtual math manipulatives for K-12 students and staff. Through Brainingcamp, users can annotate their manipulatives using a whiteboard interface, students and teachers can share ideas between devices in real-time, and teachers can access dozens of pre-designed activities to strengthen students’ conceptual understanding.
- **Knowledgehook** (available system-wide): Knowledgehook is a digital math tool available for teachers to engage students in grades 3-10 in learning mathematical concepts, checks for understanding, and provides educators with instant insights into students’ understanding of concepts. Additional tools include misconception charts and intervention materials for students.
- **MathUP** (459 English and 20 French *MathUP Classroom K-8* licences and 195 *MathUP Grade 9* licences): MathUP is a professional learning resource that contains comprehensive student materials that are fully aligned to the Grades 1-8 (2020) and Grade 9 destreamed (2021) math curricula and supports differentiated instructional practices to promote greater inclusion in math

classrooms.

Next Steps: Professional learning to support using these digital math tools will continue, including onboarding, sharing ready-made resources, and classroom implementation.

Evidence of Impact:

- **Brainingcamp:** As of December 2022, Brainingcamp was accessed approximately 104,000 times by TDSB students and staff.
- **Knowledgehook:** As of January 2023, 2255 TDSB teachers across 480 schools are using it to support the learning of 56 933 students from Kindergarten to Grade 10.
- **MathUP Classroom:** As of January 2023, approximately 340 teachers have used MathUP Classroom with 155 teachers using the program extensively.

Grade 9 Destreamed Math Project

Overview: OISE and TDSB have had a decade-long relationship to support research and improvement in mathematics education. Currently, the partnership involves exploring Grade 9 destreamed math classes and practices that work to support all students in this environment. This research into equitable structures in destreamed math classes directly informed the development of a Destreamed grade 9 Math PL series supporting professional learning in destreaming math courses (e.g., grade 9), an identified objective of the math strategy.

Participation and Timeline: Approximately 100 Grade 9 math teachers and school

administrators from over 30 TDSB secondary schools from November 2022 to April 2023.

Next Steps: Sessions will continue until the end of April, with additional data to inform the research and next steps (e.g., differentiating instruction and assessment for an academically diverse classroom, implementation of new elements of the Grade 9 destreamed math curriculum, including coding and mathematical modelling).

Evidence of Impact: Development and implementation of promising practices. After the first session, 75% of participants stated that they intend to apply their learning through a stance of professional inquiry, and 80% of participants stated that the session was worthwhile.

Building Foundational Math Skills in the Early Years: a System-Wide Collaborative Inquiry

Overview: Ensuring that all students from Kindergarten to Grade 2 have the required foundational skills and concepts in mathematics is a key component of the TDSB's Mathematics Action Plan and the Multi-Year Strategic Plan. These foundational skills and concepts include understanding quantity to trust the count and number relationships to build math facts. This project builds on previous work to further develop capacity within the system to engage in research-informed practice through a lens of equity and anti-oppression and supports the math strategy by strengthening the quality of math instruction.

Participation and Timeline: Approximately 60 elementary schools across the TDSB (10-15 schools in each Learning Centre) are part of a hands-on learning series to deepen educators' math content knowledge for teaching early concepts of addition, subtraction, multiplication, and division from February to May 2023. This builds on the PL done with K-12 Learning Coaches in the fall of 2022 to assist them with effectively engaging in local collaborative inquiries with early years teachers in the area of early numeracy development.

Next Steps: This is the second phase of research started last year and sessions will

continue until the end of May through a deep analysis of developmental continua and strategies for moving students towards math automaticity based on the research of Dr. Lawson (*What to Look For: Understanding and Developing Student Thinking in Early Numeracy*).

Evidence of Impact: Participating teachers will implement practices illustrated in PL sessions through an inquiry stance in their classrooms. Participants and central staff document these promising results for student engagement and learning.

Resource Implications

The 2022-23 school year is the fourth and final year of the Ministry of Education’s Math Strategy, which provides funding to all school boards in Ontario to support their focus on fundamental math concepts and skills, ensuring teachers are confident and capable in teaching math, and increasing parent engagement in math learning. The TDSB allocated funding towards these above-noted initiatives and digital tools to support the Ministry of Education goals to support the implementation of the 2020 elementary math curriculum and Grade 9 destreamed math course, strengthen educator math content knowledge and pedagogy on the fundamentals of math, build awareness for parents and ensure students, parents, teacher and leaders have the support, tools and resources they need to improve student learning and confidence in math.

Project and Staffing	Source of Funding
Building Thinking Classrooms in Mathematics Through an Anti-Oppressive Lens	Mathematics Department Funds, Math Strategy Funds and Ministry De-streaming Implementation Supports
Digital Tools	<ul style="list-style-type: none"> • Brainingcamp: Math Strategy Funds • Knowledgehook: Ministry Digital Math Tools • MathUp: Math Strategy Funds and Ministry De-streaming Implementation Supports
Building Foundational Math Skills in the Early Years	Mathematics Department Funds Math Strategy Funds
Grade 9 Destreamed Math Project	Math Strategy Funds

Communications Considerations

A New Communications plan is being developed for the Math department to formalize processes around the department's internal reporting in addition to system and public engagement (e.g., Twitter, Instagram, Direct Line, Newsletters, and websites) and cohesion and alignment of practices.

Board Policy and Procedure Reference(s)

[Policy P038 - Transforming Student Learning in Literacy and Mathematics](#)

Appendices

Appendix A: [TDSB Mathematics Action Plan](#)

From

Audley Salmon, Associate Director, Learning Transformation and Equity at audley.salmon@tdsb.on.ca or at 416-397-3187

Mervi Salo, Centrally Assigned Principal, Learning Transformation and Equity at mervi.salo@tdsb.on.ca or at 416-394-7281

Mahfuza Rahman, Acting Coordinator, Mathematics, Science, STEM & Robotics at mahfuza.rahman@tdsb.on.ca or at 416-396-9167

Jason To, Coordinator, Secondary Mathematics and Academic Pathways at jason.to@tdsb.on.ca or at 416-395-2198

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SETTING THE CONTEXT

Mathematical skills, knowledge and processes play a crucial part in developing active and informed citizens in a society where data and technology continue to play greater roles. In recognition of this, it is important that all students' learning opportunities are mathematically rich, meaningful to students, and serve to expand their understanding of the world around them. The Toronto District School Board is committed to ensuring that mathematics teaching and learning meets this objective.

The [Multi-Year Strategic Plan](#) identifies goals and actions that guide the work of the system, schools and classrooms to support students' development of mathematical thinking, procedural fluency and conceptual understanding. The [Vision for Learning](#) illustrates that deep learning practices, supported by technology, are vital for modern learners to view mathematics as worthwhile

and themselves as effective math learners and doers. Through the TDSB's commitment to equity, inclusion and anti-oppression, mathematics instruction should reflect the voices, identities, abilities, lived experiences and expertise of students through an [Inclusive Design](#) approach. It is also through this commitment that systemic barriers to high-quality mathematics education are identified, addressed and eliminated.

The TDSB Mathematics Plan has been created through consultations with various stakeholders and in alignment with the board's vision, mission and values. It provides more specific directions to the system, schools, and classrooms for actions and ongoing improvement efforts in the service of developing students' mathematical skills and thinking.

DRIVING QUESTIONS



The seven questions below guided the discourse amongst various stakeholders across the TDSB and the eventual development of the TDSB Mathematics Plan. School teams are invited to use the following questions to begin local discourse on improving mathematics teaching and learning within the context of this system plan:

- What barriers might be preventing our underserved students from achieving the expected outcomes in mathematics?
- How might we differentiate assessment and instruction to support learners with special education needs in mathematics classrooms?
- What's working/not working with respect to capacity building in mathematics?
- How do we know we are building educator content knowledge and pedagogy in mathematics?
- What evidence will indicate impact?
- What does the evidence indicate about the actual impact? How do we know?
- How do we build coherence and embed differentiation in professional learning to improve achievement?



SYSTEM GOALS

Based on the [Multi Year Strategic Plan](#), which reflects the TDSB's commitments to equity, achievement and well-being, the following system goals in mathematics have been identified:

- Increasing teacher and leader capacity in [mathematics knowledge for teaching](#) and the effective implementation of [research-informed instructional](#) and [intervention practices](#).
- Increasing teacher and leader capacity in supporting mathematics learning for students with special education needs in the most inclusive learning environment
- Improving academic outcomes in mathematics for Black and Indigenous students through professional learning and the use of effective evidence-based practices
- Ensuring all students in Grade 2 will have the required foundational skills and concepts in mathematics through an engaging classroom program
- Supporting the majority of our students to study Grade 9 and 10 Academic mathematics courses
- Providing all students with deep learning opportunities, supported by technology, leading to the strengthening of global competencies and improved achievement

SHARED BELIEFS AND BARRIERS



Some Shared Beliefs:

- All students are capable of high levels of achievement in mathematics.
- All students are entitled to the most enabling learning environments possible.
- Transforming student learning in mathematics is a shared responsibility.
- The most effective professional learning builds educator capacity, provides opportunity for job-embedded learning, results in permanent changes to practice and supports student achievement.

Some Barriers:

- Deficit views of underserved students lead to some students not held to high expectations of success, which further exacerbates and perpetuates a cycle of marginalization.
- Disproportionately high numbers of underserved students are streamed to Applied and Locally Developed courses in Grade 9 and continue to experience high rates of underachievement and poorer educational outcomes.
- The disconnect between understanding different ways of knowing and doing mathematics across cultures and reflecting this math diversity in classrooms and professional practice.
- Some professional learning foci do not yet enhance teachers' content knowledge, math teaching skills, and student engagement.



KEY MONITORING ACTIONS

- Superintendent of Education (SOE) and school administrator observations regarding mathematics knowledge for teaching in schools and classrooms.
- Utilize a SOE monitoring tool to monitor school-based practices in relation to Inclusive Design.
- Utilize [math developmental continua](#) to determine the progress of student learning, particularly with Grade 2 students and foundational math skills.
- Utilize the process of [collaborative analysis of student math thinking](#) to assess students' and educators' learning over time.
- Develop measurements to assess the effectiveness of digital tools and the quality of their implementation.
- Gather educator reflections on self-efficacy in math knowledge for teaching and leading.
- Assess participants' reactions to and learning from professional development sessions.
- Monitor the enrollment of TDSB mathematics AQ courses and their impact on educators' math knowledge for teaching.
- Monitor the number of students underachieving in numeracy receiving accommodations and/or modifications in their math curriculum as identified by students' Individual Education Plan.
- Monitor the percentage of students enrolled in academic, applied and locally developed math courses in secondary schools.
- Gather student feedback (e.g., focus groups) on mathematics learning and the changes they are experiencing over the implementation of this plan.
- Gather classroom educator, school leader, family and community feedback on the content and implementation of this plan

INDICATORS OF SUCCESS



- Students will experience a greater sense of belonging to school, as well as the joy of mathematics. Students will come to understand and appreciate the relevance of mathematics in their lives and see themselves as effective mathematics practitioners, leading to enhanced self-efficacy.
- Effective professional learning will enhance teacher capacity in terms of content knowledge and pedagogical practices, including the use of accommodations and modifications, and achievement scores will improve for all learners, including students from historically marginalized groups.
- All students will experience deep learning opportunities, supported by technology, leading to improved achievement.
- EQAO assessments will indicate an improvement in Mathematics (Grade 3, 6, and 9 Applied and Academic).
- A greater proportion of students will access post-secondary programs.
- Teacher and Principal/Vice-Principal participation rates will increase in mathematics AQ courses.
- Improvements would be observed through - student achievement data including report cards and EQAO, classroom observations, Superintendent of Education school visits, web analysis, surveys (AQ courses), focus groups, professional learning feedback.
- Ministry of Education funds for mathematics will be used to support the building of content knowledge and instructional capacity.

KEY SYSTEM STRATEGIES AND ACTIONS

BUILDING CAPACITY AND CONTENT KNOWLEDGE

CLASSROOM EDUCATORS

- Apply professional learning to program planning, instruction, and assessment practices to enhance mathematics teaching and learning.
- Implement, through professional inquiry, the use of tools and representations to support the development of students' conceptual understanding and procedural fluency.
- Engage in system, school- and self-directed professional learning grounded in research.

SCHOOL LEADERSHIP TEAMS

- Develop data-informed school improvement plans and professional learning needs as a staff focusing on enhancing mathematics teaching and learning for underachieving and underserved students.
- Engage in job-embedded collaborative inquiry as teams of educators, including support staff and administrators with the strategic support of learning coaches, to build capacity and collective efficacy.
- Provide ongoing opportunities for educators to collaborate in job-embedded professional learning (e.g. observations, co-planning, co-teaching, and debriefing).
- Align resources to support school improvement efforts related to mathematics.
- Engage in research-based mathematics [resources](#), such as the [Guides to Effective Instruction](#), [Paying Attention to Mathematics Education](#), and [Ministry monographs](#).

SYSTEM/LEARNING CENTRE LEADERS

- provide professional learning opportunities that build on existing mathematical ideas as a resource for learning math content, and inclusive instructional and assessment practices (e.g., Universal Design for Learning, differentiated instruction).
- Provide professional learning on early numeracy development for system leaders and school teams.
- Use an Inclusive Design approach to professional learning with a focus on leadership capacity and critical practice.
- Consult with external mathematics educators and researchers.
- Establish strategic school clusters to engage staff in relevant job-embedded professional learning.
- Support the use of digital tools to develop students' mathematical thinking and enhance engagement.
- Support Learning Coaches as they work collaboratively with Student Success Transitions Counsellors, and classroom teachers to close learning gaps for all students.
- Enrol school teams in TDSB mathematics Additional Qualifications courses.
- Engage as system leaders in [Ministry of Education learning sessions](#).
- Monitor the effectiveness and impact of professional learning on teacher practice and well-being, student achievement and well-being, and equitable outcomes.

ENSURING COHERENCE

CLASSROOM EDUCATORS

- Apply professional learning and implement initiatives aimed at addressing the goals of the school improvement plan.
- Utilize math tools, resources, and instructional approaches that are supported by the system and grounded in research.
- Ensure assessment practices and instruction are aligned with the Ontario mathematics curriculum and related Ministry of Education policy documents.

SCHOOL LEADERSHIP TEAMS

- Ensure goals within the school improvement plan are aligned with Learning Centre and system math plans.
- Explore as a staff the TDSB [Mathematics/Numeracy K-12 Expected Practices](#).
- Provide feedback regarding the direction and implementation of system and Learning Centre math plans to the Leadership, Learning and School Improvement department and Learning Centre leadership.

SYSTEM/LEARNING CENTRE LEADERS

- Develop a TDSB math team representing a diversity of roles and voices to co-develop and monitor a system-wide mathematics plan.
- Align math plans and professional learning amongst TDSB Mathematics and Numeracy Department, Learning Centers and other TDSB departments to transform student learning.
- Identify students who are underserved, their strengths and areas of improvement to inform professional learning.
- Establish exploration classrooms in each learning centre to support consistent adoption of evidence-based instructional strategies and math digital tools.
- Organize system-wide conferences (e.g. Eureka!, STEM Equity) that mobilize knowledge and expertise across schools and learning centres.
- Discuss and examine math improvement efforts in schools during Learning Network meetings.
- Update resources on internal and external TDSB math websites.
- Create a monthly Mathematics Communication that goes out to the system to share system messages, math research, links to articles, resources, and links back to our math webpage.

DIFFERENTIATING ASSESSMENT AND INSTRUCTION

CLASSROOM EDUCATORS

- Develop teaching that uses students' existing mathematical ideas as a resource for learning.
- [Differentiate](#) assessment (observations, conversations, products) to inform program development, and instruction (e.g. guided group, parallel tasks, math centres) to respond.
- Use math tools, beyond paper, pencil and calculator (e.g. digital tools, [concrete](#) and [virtual manipulatives](#)) to deepen students' conceptual understanding, enhance learning experiences and improve performance.
- Develop students' learning profiles by identifying strengths and areas of growth, and utilize profiles to inform instruction.
- Provide students with opportunities to engage in deep learning opportunities supported by technology.

SCHOOL LEADERSHIP TEAMS

- Track students over time at the school level so that effective instructional strategies are passed on from year to year and educators can build a network of supports.
- Support educators with the development of learner profiles to inform differentiated instruction and assessment planning.
- Ensure that throughout the school year, students are provided with the accommodations they need to demonstrate the full extent of their understanding.
- Ensure students are accommodated during EQAO assessments in a manner that aligns with the [EQAO's revised assessment and accommodations policies](#) and their Individual Education Plan, if applicable.
- Recognize opportunities to support student learning of mathematics that exist outside of the math classroom - including technological education and other experiential learning opportunities

SYSTEM/LEARNING CENTRE LEADERS

- Review existing mathematics assessment tools and provide professional learning on their effective use.
- Provide ongoing professional learning opportunities on developing effective learner profiles with respect to mathematics and effective teaching strategies in response to students' strengths and areas of growth.
- Support teachers in developing an understanding of which tools, models and representations to select and when to use them in order to reveal, push and or develop mathematical thinking.
- Model effective differentiation during professional learning sessions in authentic contexts (e.g. demonstration classrooms, job-embedded learning opportunities).
- Promote the Technological Education curriculum for all students to support deep learning and the hands-on application of mathematical thinking.

CHALLENGING STREAMING AND PROMOTING INCLUSION

CLASSROOM EDUCATORS

- Review the effective use of [Universal Design for Learning](#).
- Ensure that teaching practices reflect high expectations, students' identities and lived realities while honoring and developing students' voice and expertise.
- Implement mathematics lessons that are culturally relevant and responsive, as well as regularly incorporate issues of social justice in mathematics learning.
- Build positive relationships and learning spaces that focus on inclusive instruction tied to high expectations, in an environment that develops their identity as mathematical thinkers and increases student confidence in math.

SCHOOL LEADERSHIP TEAMS

- Welcome all students, while providing open, inclusive and enabling learning spaces.
- Encourage and support the inclusion of students with special education needs in regular classes.
- Engage in ongoing examination of mathematics curriculum and courses of study through the critical integrative approach to inclusive schools, including integrating multiple centres of knowledge.
- Monitor disproportionate representation of underserved student identities in non-academic math programming and in-risk situations regarding mathematics achievement.

SYSTEM/LEARNING CENTRE LEADERS

- Provide support and professional learning necessary to effectively challenge streaming and promote inclusion from K-12, in areas including but not limited to:
 - Students' acquisition of required [foundational math skills and concepts by Grade 2](#), designed with the Early Years Department.
 - [Universal Design for Learning and differentiated instruction](#), designed in collaboration with special education consultants.
 - [Supporting students with learning disabilities in math](#), with a focus on Junior and Intermediate grades.
 - An Academic Math Strategy that outlines professional learning for ACLs and secondary math teachers, supports for students and parents/caregivers and cross-panel collaboration, developed with Learning Centre math teams.
 - A network of excellence in inclusive mathematics whereby school teams can visit classrooms where inclusion is effectively closing achievement gaps for students with special education needs.
- Examine critically the mathematical needs of students with special education needs (e.g. how can assistive technology and manipulatives be used to enhance students' math experiences?).
- Collaborate with the Urban Indigenous Education Centre to develop professional learning on mathematics through Indigenous perspectives and ways of knowing.
- Provide system-wide professional learning on teaching mathematics for social justice and using culturally responsive and relevant pedagogy in mathematics.
- Monitor and report on rates of special education needs identifications, student achievement and credit accumulation in academic mathematics courses, student choice in math for Grades 11 and 12, and post-secondary enrollment by demographic groups.

ENGAGING PARENTS, FAMILIES AND COMMUNITIES

CLASSROOM EDUCATORS

- Honour student and parent voice by acting on explicit information/feedback gathered about mathematics programming.
- Utilize community resources to learn about different cultural ways of knowing and doing mathematics and provide opportunities for experiential and transdisciplinary learning opportunities with mathematics that enhance students' development of global competencies.
- Plan responsive instruction that honours students' identities, abilities, lived experiences and expertise by building collaborative partnerships with families and the wider community.

SCHOOL LEADERSHIP TEAMS

- Host school-wide math-focused learning opportunities that engage parents and caregivers as partners.
- Increase awareness of multiple post-secondary pathways in mathematics to parents/caregivers and students.
- Facilitate sessions to enhance parents' and caregivers' understanding of [Ontario Ministry curriculum](#) and [Focus on the Fundamentals of Math documents](#).

SYSTEM/LEARNING CENTRE LEADERS

- Implement Learning Centre-based math-focused parent symposia that enhance capacity and lead to increased parental engagement.
 - Partner with community and social agencies to create expanded opportunities for innovation and external support.
 - Promote resources, including [provincial parent resources](#) and [online support](#), on the TDSB external webpage to support parents and staff.
- ### SYSTEM/LEARNING CENTRE LEADERS
- Seek ongoing feedback from various stakeholders regarding elements of the TDSB Mathematics Plan.
 - Provide math updates through communications at all levels (system, Learning Centre, school and classroom).