Collaborative Developmental Evaluation Report for the Eastern Ontario Staff Development Network Mathematics Project Year 5

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Table of Contents

Section 1: Background

Introduction

Effective professional learning opportunities for educators are critical to developing and enhancing instructional practices that support desired student outcomes. Contemporary professional learning initiatives prioritize ongoing, school- and classroom-embedded opportunities that enable recursive cycles of collaborative learning among educators, guided by systemic goals but rooted in local needs and priorities (Hargreaves & Ainscow, 2015; Opfer & Pedder, 2011). Cycles of professional learning are informed by relevant evidence from research and practice (Bryk, 2015; Donohoo, 2013), and often supported by middle leader facilitators—typically former classroom teachers who have demonstrated capacity and interest in supporting professional learning among school-based educators (Fullan, 2015; Timperley, 2011).

In recent years, networked professional learning facilitated by middle leaders has emerged as a promising approach to support collaborative professional learning within and across educational systems. Networked models aim to build educators' knowledge and stimulate changes in practice, with the goal of systematically improving students' learning outcomes (Campbell et al., 2017; Katz & Earl, 2010; Muijs & Ainscow, 2010; Moolenar, 2012). Networked professional learning is characterized by simultaneous activities across individual teachers, schools, and collectives engaged in learning within and across contexts of educational systems (Opfer & Pedder, 2011). These networked initiatives endeavour to simultaneously meet micro (individual), meso (local), and macro (systemic) needs among educators (Bore & Wright, 2009; Davis & Sumara, 2006).

Researchers and practitioners alike have acknowledged the complexity associated with supporting and demonstrating widespread change among educators and students through networked professional learning initiatives. First and foremost, it is difficult to determine causal impacts of professional learning on educators and students because systems are constantly changing (e.g., students changing grades or schools, teachers changing placements, leadership changing in schools or districts, priorities changing in districts or governments) (Desmine & Garet, 2015). Second, it is often easier to measure near outcomes (e.g., educators' perceptions) than far outcomes (e.g., students' learning) (Earl & Katz, 2006), with impacts on students often more evident in teachers' classrooms the year following their participation in professional learning (Kennedy, 2016). Third, while system-level funders typically seek evidence of effectiveness through large-scale student achievement measures, qualitative data sources (e.g., classroom observations, classroom video, or student works samples) often provide more nuanced practice-based evidence of emerging professional learning impacts, especially in classrooms and schools (Bryk, 2015; Darling-Hammond, 2010; LaPointe-McEwan, DeLuca, & Klinger, 2017). Fourth, educators vary in their response to the same professional learning opportunities—what they want to learn, what they are ready to learn, and how they want to learn it—due to prior experiences, prevailing beliefs, and perceived needs (Desimone & Garet, 2015; Vangrieken, Meredith, Packer, & Kyndt, 2017). Finally, achieving desired professional learning outcomes for educators and students requires substantial time and educator commitment. According to Guskey (2014), change in educational systems occurs in five stages: participant reactions, participant learning, organizational support and change, participant use of new knowledge, and student learning outcomes. Moreover, Kennedy (2016) asserts that, "Any new idea offered by [professional learning] requires not merely adoption but also abandonment of a prior approach" (p. 948). The result is that there will be substantial variation

between the learning that educators obtain, and their subsequent actions in response to that learning. While educators may demonstrate very high commitment to professional learning, the impacts on their instructional practice and pedagogy may be less pronounced and/or difficult to determine.

Given the potential benefits and prevailing challenges associated with networked professional learning facilitated by middle leaders, system educators and professional learning funders are consistently seeking a deeper understanding of the factors that contribute to desired shifts among educators and students in order to maximize investments in professional learning and realize desired outcomes for both educators and students. In a recent review of contemporary professional learning literature (2005-present), LaPointe-McEwan, Heggie, and Klinger (2018) constructed a framework that identified and described eleven categories of factors that contribute to shifts in educators' thinking and practices, with the underlying assumption that these shifts ultimately support valued student outcomes (see Figure 1). These categories (see Column 2) are organized into three broad themes—FOCUS, ENACTMENT, and SUPPORTS. According to the framework, professional learning focused on relevant content that is directly linked to student outcomes and aligned with both local and systemic priorities enhances professional learning outcomes among educators. In addition, educators are impacted by professional learning that is enacted through sustained cycles of collaborative, inquiry-based learning embedded in their contexts of practice and differentiated to respond to their personal needs, beliefs, and interests. Finally, educators engaged in professional learning are supported by formal and informal networked leadership across educational contexts rooted in trust and respect, as well as opportunities for capacity building with knowledgeable others and relevant resources and tools.

Kennedy (2016) offers an additional insight into the development and implementation of professional learning within educational systems. She suggests moving away from conceptualizing effective professional learning as a set of design features because these features may be unreliable predictors of success. According to Kennedy, in the absence of an overarching theory of educator learning, effective professional learning should be rooted in a "more nuanced understanding of what [educators] do, what motivates them, and how they learn and grow" (p. 974). In her review of 28 quasi-experimental studies of professional learning, she found that the greatest impacts on educators and students occurred when the professional learning:

- combined a focus on curriculum content with another focal area (e.g. revealing student thinking);
- helped educators develop strategies and insights into practice; and
- supported educators' capacities to apply new learning and make professional judgements on behalf of students in classrooms.

Taken together, the professional learning framework (Figure 1) and Kennedy's (2016) articulation of effective professional learning offer research-based evidence to guide educators' purposeful planning and reflection with respect to professional learning in educational systems.

Factors that Contribute to Shifts in Educator Thinking and Practice		Key Findings from Literature Review
Focus	Relevant content	Professional learning content is evidence-informed, focused on content and pedagogical knowledge, and connected to classroom implementation.
	Student outcomes	Professional learning prioritizes links between educator practices and student outcomes and is considerate of how students interact with content and pedagogy.
	Coherence and alignment	Professional learning content and activities are consistent with curriculum goals, students' and educators' needs, as well as system policies and priorities.
Enactment	Job-embedded collaboration	Educators learn collaboratively with colleagues in their context of practice to build an engaged professional learning community that collectively supports valued student outcomes.
	Sustained momentum	Professional learning provides ongoing, supported opportunities for educators to learn new content, explore new ways of thinking, and refine implementation of new practices.
	Active learning	Educators engage in cycles of inquiry-based learning with opportunities to explore problems of practice, challenge beliefs, receive feedback from colleagues, and analyze student learning.
	Differentiated opportunities	Professional learning provides collective experiences that are responsive to educators' beliefs, needs, interests, learning preferences, and contexts of practice.
Supports	Networked leadership	Formal and informal leaders across educational contexts promote a supportive culture that fosters positive shifts in educator practice and student outcomes.
	Knowledgeable others	Knowledgeable others provide capacity building that shifts educators' knowledge, beliefs, and/or practices in ways that support of student outcomes.
	Trust and respect	Trusting relationships among educators promote professional risk-taking, common knowledge building, shared learning experiences, and collective responsibility for student outcomes.
	Resources and tools	Educators leverage current resources and tools to help them learn about content, implement new practices, and assess impacts on students.

Figure 1. Professional learning factors that contribute to shifts in educators' thinking and practice.

The EOSDN Mathematics Project

Supported by funding from the Ontario Ministry of Education, the Eastern Ontario Staff Development Network (EOSDN), a consortium of Eastern Ontario District School Boards (DSBs) and the Faculty of Education at Queen's University, have worked together for the past five years to enhance professional discourse, instructional practices, and student outcomes in the context of mathematics. Through this project, the nine Eastern Ontario English language DSBs collectively and collaboratively focused on building educator fluency among school-based educators (teachers, support teachers, administrators), district educators, and researchers in the region.

Beliefs

This multi-year project has been developed and implemented on the foundational belief that networked opportunities to explore, examine, and challenge our instructional beliefs and mindsets about teaching and learning math will lead to significant, positive shifts in practice and pedagogy. Through opportunities to network, co-plan lessons, observe and assess students' learning, and to moderate student work, educators develop fluency in: (a) the observation, description, and analysis of students' learning and their learning products (i.e., knowing what to look and listen for); and (b) posing questions, providing feedback, and consolidating learning in ways that promote student thinking (i.e., shifting the role of the teacher from instructor to co-learner/coach).

Math Curriculum Content and Processes

The math content focus of the EOSDN Math Project (EMP) is on fundamental, or *big ideas*, in math that cut across strands, have relevance for K-12 curriculum, and for which the Ministry and EQAO have produced current support materials. The math process focus of the project is representing mathematical thinking, linking to the goal of developing educators' fluency in observation, description, and analysis.

Strategies for Representing Thinking

The focus in math classrooms is to have students working on open, relevant problems. Students and teachers engage in math talk so mathematical thinking is revealed, leading to rich discourses about the *big ideas* in math. Students also illustrate their thinking through the use of manipulatives, models, and demonstrations. The focus for teachers is observing and analyzing, posing questions, providing feedback, and consolidating learning in ways that promote student thinking. In Years 4 and 5, effective strategies promoted through the provincial Renewed Math Strategy (RMS) are incorporated.

Resources

The work within the EMP is based on Ontario Ministry of Education documents including the *Mathematics Curriculum* documents, *Learning for All*, *Growing Success*, and the *Paying Attention to Mathematics* monograph series. In addition, the EMP has leveraged various professional resources (e.g., YCDSB's *Supporting Students with LD in Mathematics* and YRDSB's *Understanding Learning Disabilities: How Processing Affects Learning Waterfall Chart*) and professional literature (e.g., *Five Practices for Orchestrating Productive Mathematics Discussions The Four Roles of the Numerate Learner*, and *What to Look For*).

Research and Implementation

External math and research experts are engaged to support effective and efficient monitoring of implementation – to advise on how to assess and document evidence of the learning of students and how to gauge the impact of strategies as they are being incorporated into classroom practice – both within the project inquiries, as well as in relation to Board and School Improvement Planning for Student Achievement (i.e., BIPSA and SIPSA) goals and strategies.

Across the five years of the project, collectively we have learned, and continue to learn, about our own professional learning needs, the structures that effectively support shifts in mathematics instruction, and the ways in which these shifts impact teachers and students. The results from each year have provided critical insights for our learning and efforts in subsequent years.

Year 1 (2013-2014)

In Year 1 of the project, math leaders from each district school board (DSB) met monthly to learn more about strategic implementation and monitoring with support from recognized experts in the teaching of math, Queen's University researchers, Ministry of Education Student Achievement Officers, and an EQAO School Support and Outreach Education Officer. As a result, Eastern Ontario math leaders enhanced their own fluency with regards to facilitating and supporting educators within each of their DSBs. The 1100 educators involved in Year 1 of the project collaborated within and across schools, focusing on local, specific needs that related to the parameters of the regional project. All participants had access to math and research experts to develop, refine, and reflect on their math content knowledge and instructional strategies, both at regional and district gatherings. The first year of the project initiated the study of the five key areas impacting teaching and learning: Beliefs, Curriculum, Strategies for Representing Thinking, Resources, and Research and Implementation. See Appendix A for a summary of Year 1 activities and key findings.

Year 2 (2014-2015)

In 2014-2015, the EMP provided continued opportunities to further enhance professional discourse and instructional practice in the EOSDN region with a sustained focus on building educator fluency (i.e., applying understanding in practice) in mathematical *big ideas* (e.g., proportional reasoning) and the process of representation in math. Throughout Year 2, 700 educators involved in the project collaborated within and across schools focusing on local, specific needs that related to the five key parameters of the regional project: math curriculum content/process and mindset, designing effective collaborative inquiry for student learning, inclusive practices for all students, gauging our impact, and collaborative leadership among educators. This collaboration extended to include working partnerships with math and research experts to develop, refine, and reflect on the educators' math content knowledge and instructional strategies, both at regional and district gatherings. See Appendix B for a summary of Year 2 activities and key findings.

Year 3 (2015-2016)

In its third year, (2015-2016), the EMP provided an opportunity for 700 regional educators to continue their focus on educator fluency, mathematical *big ideas*, and the process of representation in math. In Year 3, the project adopted a more precise emphasis on evidence-use to support math teaching and learning within and across contexts of the network (i.e., classrooms, schools, districts, and the region). Moreover, Year 3 participants explored various approaches to cultivating collaborative leadership among educators in schools and districts to spread and sustain regional learning beyond the project. See Appendix C for a summary of Year 3 activities and key findings.

Year 4 (2016-2017)

In Year 4 (2016-2017), the EMP was informed by the Renewed Math Strategy (RMS), introduced by the province in Spring 2016. The project was refocused to align with the provincial emphasis on a whole-school approach and purposeful inquiry focused on supporting students struggling in mathematics. Specifically, while the EMP sustained its regional focus on educator fluency, *big ideas* in math, and the process of representation of mathematical thinking, the project also incorporated the RMS priorities of supporting students who struggle in mathematics, especially students with identified learning disabilities, through a whole-school approach—leveraging asset-based learner profiles, responsive instruction, targeted accommodations, and assistive technology. See Appendix D for a summary of Year 4 Steering Committee meeting activities and key findings.

Year 5 (2017-2018)

In Year 5 (2017-2018), the EMP continued to be informed by the Renewed Math Strategy (RMS), aligning with the provincial emphasis on a whole-school approach and purposeful inquiry focused on supporting students struggling in mathematics. As in Year 4, the EMP sustained its regional focus on educator fluency, *big ideas* in math, and the process of representation of mathematical thinking, concurrently incorporating the RMS priorities of supporting students who struggle in mathematics, especially students with identified learning disabilities, through a whole-school approach—leveraging asset-based learner profiles, responsive instruction, targeted accommodations, and assistive technology. Forty-two schools and approximately 200 educators participated directly in regional learning sessions. See Appendix E for a summary of Year 5 Steering Committee meeting activities. Year 5 project activities are summarized in Figure 2 and findings are included in Sections 4 and 5 of this report.

2017-2018 EOSDN Regional Mathematics Project Activities		
Month	**Participants**	**Agenda**
September 7, 2017	Supervisory Officers; System Principals; Steering Committee Rep; Math Lead; Special Education Lead	Leveraging the Learning: Building upon the Regional Mathematics Project in DSBs
October 12, 2017	Administrators from DSB selected schools; Steering Committee Rep; Math Lead; Special Education Lead	Supporting School Leaders: 5 Key Areas of Practice-based Learning – Regional Mathematics Project Monograph
November 23, 2017	Administrators from DSB selected schools; School Math Leads; School Spec. Ed. Lead; Classroom Teachers; Steering Committee Rep; Math Lead; Special Education Lead	Supporting School Teams: Students of Mystery, Learning Profiles, LD in Mathematics External Expert: Connie Quadrini
December 14, 2017	Steering Committee Rep; Math Lead; Special Education Lead	Sharing/Consolidating the Learning in DSBS: Internal Experts: Steering Committee Math Leads, Ministry SAOs
January 11, 2018	Steering Committee Rep; Math Lead Special Education Lead	Grade 9 Mathematics Study Group External Expert: Christine Suurtamm
February 8, 2018	Administrators from DSB selected schools; School Math Leads; School Spec. Ed. Lead; Classroom Teachers; Steering Committee Rep; Math Lead; Special Education Lead	Supporting School Teams: Resources and Strategies for Students of Mystery in Mathematics External Expert: Connie Quadrini
March 7 & 8, 2018	Steering Committee Rep; Math Lead; Special Education Lead	K-3 Continuum of Learning in Mathematics External Expert: Heather Wark (Alex Lawson – *What to Look For*)
April 5, 2018	Steering Committee Rep; Math Lead Special Education Lead	Sharing the Learning: Internal Experts, Ministry SAOs Planning for May Consolidation
May 9-10, 2018 (Consolidation Days)	All participants in EOSDN Math Project 2017-18	Consolidating the Learning with School Teams; Analysis of Data, Initial Preparation of DSB Research Posters External Expert: Connie Quadrini
June 14-15, 2018	Steering Committee Rep; Math Lead; Special Education Lead	K-3 Continuum of Learning in Mathematics, Part 2 External Expert: Heather Wark (Alex Lawson – *What to Look For*)

Figure 2. Year 5 EMP activities.

Section 2: Evaluation Questions

Formulating Evaluation Questions

Each year, the EOSDN Math Project (EMP) is guided by a collectively determined regional inquiry question developed by regional Steering Committee members. The regional inquiry question operates as the overarching developmental collaborative evaluation focus for the EMP each year.

In Years 1 through 4, the regional inquiry question remained consistent:

> **How will a regional focus on proportional reasoning, educator fluency, and the process of representation impact math teaching and learning in eastern Ontario?**

In Year 5, the regional inquiry question was revised to reflect the most current Ministry of Education priorities associated with the Renewed Math Strategies (RMS) and Year 4 findings:

> **How will a regional focus on sense of number, educator and learner fluency, and the process of representation impact math teaching and learning in eastern Ontario?**

In association with the regional inquiry question, guiding questions were developed through collaboration among the EMP project leads, district facilitators, and Queen's University research partners to inform project activities and data collection each year. Over time, these guiding questions became deeper and more focused, reflecting regional learning and collaborative capacity building.

EOSDN Math Project Guiding Questions
Year 1 (2013-2014)

The following guiding questions were developed collaboratively between the project leads and Queen's research partners to guide the Year 1 project evaluation:

1. What structures support the success of a regional collaborative professional learning initiative based on educators' roles, backgrounds, and previous experiences with professional learning?

2. How do inquiry processes support the success of a regional collaborative professional learning initiative?

3. How do relationships between educators and external learning partners support the success of a regional collaborative professional learning initiative?

Year 2 (2014-2015)

The subsequent guiding questions were developed among the EMP project leads, Queen's University research partners, Ontario Ministry of Education student achievement officers, and district math facilitators at the start of Year 2 of the project. At the September 2014 Steering Committee session, the four key recommendations for Year 2 of the project were shared from the Year 1 evaluation report. The Steering Committee, as a collective, worked through a process of determining the regional guiding questions that would be addressed during subsequent Steering Committee sessions.

1. How does facilitator fluency with assessment, monitoring, data literacy, and coaching influence math teaching and learning in schools?

2. What are the elements of a vibrant learning culture for math, and how can these be fostered in classrooms and school communities?

3. How does a deeper understanding of math content (e.g., proportional reasoning) contribute to the more effective use of formative assessment practices among educators?

4. What professional learning supports and responsive feedback structures contribute to students' learning?

Year 3 (2015-2016)

As in Year 2, the guiding questions for Year 3 were developed among the EMP project leads, Queen's University research partners, Ontario Ministry of Education student achievement officers, and district math facilitators during the November 2015 Steering Committee session, enabling all facilitators to participate in the process. At this session, the four key recommendations for Year 3 of the project were shared from the Year 2 evaluation report, and the Steering Committee members collectively determined regional guiding question for Year 3.

1. How do we transfer facilitator fluency to school fluency with respect to assessment, monitoring, data literacy, and coaching to enhance math teaching and learning?

2. How might we cultivate collaborative leadership among educators in our region, DSBs, schools, and classrooms to sustain and spread learning in math?

3. How might a focus on key practices (e.g., pedagogical documentation, reflection) support formative assessment and monitoring of regional math learning and instructional practice?

4. How might a professional learning framework (e.g., lesson study, classroom video analysis, collaborative inquiry) support responsive practice of facilitators and educators?

Year 4 (2016-2017)

The guiding questions for Year 4 were developed collaboratively among the EMP project leads, Queen's University research partners, Ontario Ministry of Education student achievement officers, and district facilitators (both math and special education leads) during the September 2016 Steering Committee session. The development of Year 4 guiding questions was informed by the Year 3 regional findings and key recommendations, as well as provincial Renewed Math Strategy (RMS) priorities.

1. How might we transfer facilitator fluency to school fluency with respect to assessment, monitoring, data literacy, and coaching to enhance math learning, teaching, and leading?

2. How might we cultivate collaborative leadership for shared ownership among educators in our region, DSBs, schools, and classrooms to sustain, deepen, and spread learning, teaching, and leading in mathematics?

3. How might a focus on key practices (e.g., understanding learner profiles, diagnostics, pedagogical documentation, reflection) help us name and notice student learning to inform, sustain, and spread precise, personalized assessment and instruction in mathematics?

4. How might precise, personalized assessment and instruction in mathematics respond to the needs of each learner?

Year 5 (2017-2018)

In Year 5, guiding questions were developed collaboratively among the EMP project leads, Queen's University research partners, Ontario Ministry of Education student achievement officers, and district facilitators (both math and special education leads) during the Year 4 Steering Committee session in June 2017. The development of the Year 5 guiding questions was informed by the Year 4 regional findings and key recommendations, as well as provincial Renewed Math Strategy (RMS) priorities.

Teaching and Learning

1. How are educators using key practices (e.g., learner profiles, diagnostics, pedagogical documentation, technology, reflection) to respond to the needs of each learner through precise, personalized instruction?
2. How are key educator practices supporting students' learning and achievement in math? (specifically, sense of number and process of representation)

Spread and Sustainability

3. How is a whole-school approach contributing to shared ownership of students' math achievement among all educators?
4. How is collaborative leadership being cultivated in schools, districts, and the region to promote spread and sustainability of enhanced math learning, teaching, and leading? (e.g., through math coaching, fostering data fluency among educators, monitoring students' learning across grades)

Section 3: Evaluation Method

Project Evaluation Methodology and Plan

Our ongoing, collaborative developmental evaluation explores the EOSDN Math Project (EMP) occurring in Eastern Ontario. This evaluation endeavours to: (a) understand and refine the implementation of the EMP over five years under complex, emergent, and dynamic conditions; (b) understand how the EMP is achieving its desired outcomes in relation to the larger educational context surrounding it; and (c) actively engage stakeholders in evaluation processes in order to enhance the overall quality of the evaluation and increase the utility of findings (Patton, 2012). Each phase of this evaluation is summarized below.

Phase 1: Building a Program Theory

One of the more difficult tasks for a program committee is to represent their program in a way that is both comprehensive and useful to initial program development and evaluation planning. The development of a *program theory* can address this dilemma. There are typically two components to a program theory. The *theory of action*, describes the assumptions underpinning program operations. The *theory of change* captures the processes intended to bring about the changes in individuals, organizations, and communities (Rogers, 2011). Together, these two aspects of a program theory can be used to first create links between the underlying framework for an initiative, the intended and enacted actions, and the expected results and changes that may occur as a result. In order to operationalize a program theory it is useful to develop a logic model connecting the theory, actions, and expected products and outcomes. There are many advantages to representing the complete program theory in a logic model:

- It provides a baseline from which to compare the program-in-theory with the program-in-action.
- Identifying the intended effects of a program also sensitizes evaluators and program personnel to unintended effects.
- If it is not possible to test the program model against a comparative or control group, a program logic model allows evaluators and program personnel to begin developing defensible causal arguments (Miles & Huberman, 1994) and offers a framework for continued program developments (i.e., developmental evaluation).

Phase 1 of the EMP evaluation was completed in the winter of 2014 and focused on building a program theory for the subsequent evaluation and research. The purpose of Phase 1 was to begin to "fill in" the theory of action and change that underpinned the EMP. The development of the program theory was an iterative process among the Queen's researchers/evaluation team and the EOSDN project leads. The logic model was also shaped by the evaluators' regular participation in Steering Committee sessions and visits to participating DSBs. The program theory helped guide the initial evaluation questions and design.

Phase 2: Exploring the Impact of the EOSDN Math Project Year 1 (2013-2014)

Phase 2 of the evaluation involved collecting data on the effectiveness of EMP activities to meet the EMP's initial aim as stipulated in the program theory. The evaluation used a collaborative developmental methodology to guide data collection and analyses. Data were collected from multiple participants including: project leads, district facilitators, teachers, school administrators, and expert learning partners (i.e., math and research experts). Data were collected in Spring 2014, at the end of Year 1 of the EMP, to provide an interim sense of the project's impact on participants' learning and practices, and to identify the structures that supported the project's success. In addition, data were obtained during project activities (i.e., Steering Committee sessions, DSB school visits, and year-end sharing sessions) to determine immediate and sustained value of project activities on professional learning and practice. See Appendix A for Year 1 Steering Committee and data collection activities, as well as key findings and recommendations.

Phase 3: Exploring the Impact of the EOSDN Math Project Year 2 (2014-2015)

Phase 3 of the evaluation continued the collection of data on the effectiveness of EMP activities to meet the EMP's initial aim as stipulated in the program theory through a collaborative developmental approach. As in Phase 2, data were collected from multiple participants including: project leads, district facilitators, teachers, school administrators, and expert learning partners (i.e., math and research experts). See Appendix B for Phase 3 (Year 2) EMP Steering Committee and data collection activities, as well as key findings and recommendations.

Phase 4: Exploring the Impact of the EOSDN Math Project Year 3 (2015-2016)

Phase 4 of the evaluation extended the collaborative developmental approach to collecting data on the effectiveness of EMP activities. As in Phases 2 and 3 (Years 1 and 2), data were collected from multiple participants including: project leads, district facilitators, teachers, school administrators, and expert learning partners (i.e., math and research experts). See Appendix C for Phase 4 (Year 3) EMP Steering Committee and data collection activities, along with key findings and recommendations.

Phase 5: Exploring the Impact of the EOSDN Math Project Year 4 (2016-2017)

Phase 5 of the evaluation maintained the collaborative developmental approach to collecting data on the effectiveness of EMP activities. As in Phases 2, 3, and 4 (Years 1, 2, and 3), data were collected from multiple participants including: project leads, district facilitators, teachers, school administrators, and expert learning partners (i.e., math and research experts). See Appendix D for Phase 5 (Year 4) EMP Steering Committee and data collection activities, along with key findings and recommendations.

Phase 6: Exploring the Impact of the EOSDN Math Project Year 5 (2017-2018)

Phase 6 of the evaluation occurred during the project's fifth year of implementation (2017-2018). The Queen's University research partners, project director, project coordinator, district facilitators (math and special education leads), and Ministry of Education student achievement officers worked collaboratively to refine evaluation questions, data collection instruments, and evaluation methods used during Phase 6. Data were collected from project leads, district facilitators, school-based educators (classroom teachers, school support teachers, and school administrators) at regular intervals throughout Phase 6 (Year 5) of the evaluation. Data were primarily collected through qualitative methods including documentation of Steering Committee and regional consolidation activities, photos, and artifacts including DSB inquiry posters. In addition, all educator participants were invited to complete exit surveys at three regional sessions and an educator participant survey in Spring 2018. Project leads also completed open-response questionnaires in Spring 2018. These multiple data collection methods were used in order to triangulate findings and to establish trustworthy results. Data collection tools (i.e., educator participant surveys and project lead questionnaire) are presented in Appendix E. Table 1 provides a summary of the data collection activities for each participant group.

Table 1: *Data Collection by Participant Group*

Participant Group	Data Collection Activity	Number	Type of Data
Project Leads -project director -project coordinator -research partner (N = 3)	Steering Committee Documentation	9	– Observation – Artifacts
	Project Lead Questionnaire	3	– Open-response
	Consolidation Day Documentation	3	– Observation – Conversation
District Facilitators -math leads -special education leads (N = 25)	Educator Participant Survey	18	– Fixed-response – Open-response
	Regional Session Exit Survey (Nov, Feb, May)	48	– Fixed-response – Open-response
	Steering Committee Consolidation Documentation-Teaching and Learning; Spread and Sustainability	9	– Observation – Conversation – Artifacts
	DSB Inquiry Poster	9	– Artifact
School-based Educators -classroom teachers -school support teachers -school administrators (N=168)	Educator Participant Survey	45	– Fixed-response – Open-response
	Regional Session Exit Survey (Nov, Feb, May)	151	– Fixed-response – Open-response
	Consolidation Day Artifacts	4	– Artifacts

Phase 7: Exploring the Impact of the EOSDN Math Project Year 6 (2018-2019)

Phase 7 of the evaluation will occur during the project's sixth year of implementation (2018-2019). The Queen's University research partners, project director, project coordinator, district facilitators (math and special education leads), and Ministry of Education student achievement officers will work collaboratively to refine evaluation questions, data collection instruments, and evaluation methods used during Phase 6. Data will be collected from project leads, district facilitators, teachers, school administrators, and relevant project partners at regular intervals throughout Phase 7 of the evaluation. In addition, EMP project leads, district facilitators, and project partners will continue to work with Ministry of Education personnel to align the work of the EMP with the provincial Renewed Math Strategy (RMS).

Data Analyses

With respect to Phase 6 (Year 5), qualitative data were analyzed using a standard thematic coding process (Namey, Guest, Thairu, & Johnson, 2008; Patton, 2002). Data were analyzed in relation to each participant group: project leads, district facilitators, school administrators, school support teachers, and classroom teachers. From an initial analysis of data, a code list was generated after which codes were grouped into broader thematic categories across educator participant groups. Codes with a high degree of co-occurrence (i.e., two or more codes used for same data) were collapsed into broader categories if they represented similar themes. Themes were then clustered based on their relation to the impact of the project on: (a) math teaching and learning, and (b) spread and sustainability.

Quantitative survey data collected from educator participants were analyzed through descriptive statistics and one-way ANOVAs. These data provided information about the impacts of the project, as well as factors that contributed to these impacts.

Results from the EMP evaluation are presented in the next section. Taken together, these findings provide the basis for key findings and recommendations for next steps of the EMP, presented in Section 5 of this report.

Section 4: Educator Participants' Perspectives

Educator participants—project leads, district facilitators, school administrators, school support teachers, and classroom teachers—offered various responses to the EMP. However, consistent across each group was a valuing of the EMP because it: (a) provided opportunities to enhance their instructional practice and students' learning through common approaches and strategies; (b) focused on local needs of educators and students; and (c) enabled spread of EMP learning within schools and DSBs.

Educator participants' perspectives are presented according to: (a) educator participant demographics; (b) inquiry focus by DSB; (c) impacts on teaching and learning; (d) impacts on spread and sustainability; (e) factors that contributed to impacts; and (f) suggestions moving forward.

Educator Participant Demographics

In total, 196 educators participated in the EMP during the 2017-2018 school year. Educator participants included three project leads (director, coordinator, and research partner), and educators representing nine DSBs in the Eastern Ontario region: 25 district facilitators (i.e., math and special education leads), 42 school administrators representing 42 schools across the region, 42 school support teachers, and 84 classroom teachers.

All educator participants contributed data at regional sessions (i.e., documentation, photos, artifacts, exit surveys). In addition, 64 educators completed the educator participant survey in Spring 2018 (32.7% response rate). Among these educators, 25 were classroom teachers (29.8% response rate), 14 were school support teachers (33.3% response rate), 6 were school administrators (14.3% response rate), and 15 were district facilitators—math and special education leads (60% response rate) (see Table 2). Of the 64 educators who responded to the survey, 26 were in their first year of the EMP (40.6%), 20 were in their second year (31.3%), and 18 had been involved in the project for three or more years (28.1%).

Table 2. *Frequency and Response Rates of Educator Participants by Role*

Demographic	# of Educator Participants (n = 64)	Frequency in Sample (%)	Response Rate (%)
Classroom teacher	25	39.0	29.8*
School support teacher	14	21.9	33.3*
School administrator	6	9.4	14.3*
District facilitator	15	23.5	60.0
Other	4	6.3	n/a

Note. *Due to the moratorium on professional learning in OCDSB, the 32 school-based educators from this DSB were not asked to respond to the survey. Without the inclusion of these educators, response rates for school-based educators were: classroom teachers 38.8%; school support teachers 41.2%; school administrators 17.6%.

Inquiry Focus by DSB

As in Year 4 of the project, each DSB identified an inquiry focus and associated guiding questions that were nested within the Year 5 regional inquiry and guiding questions (see p. 8) as well as in RMS goals and priorities (see Figure 3). Across the nine DSBs, inquiries spanned K-12 but were largely focused on elementary grades, with a greater focus on primary grades than in previous EMP years: 6 primary, 4 junior, 3 intermediate, and 1 senior (see Table 3). All DSBs' inquiry foci were multifaceted, with multiple guiding questions directing their learning throughout Year 5 of the project. Most inquiries explored assessing students' math thinking, using evidence to inform math practice, and/or cultivating collaborative leadership among school-based educators. Some inquiries also included a focus on pedagogical approaches to support *students of mystery* in math such as leveraging learner profiles, using conceptual continua, or providing personalized instruction.

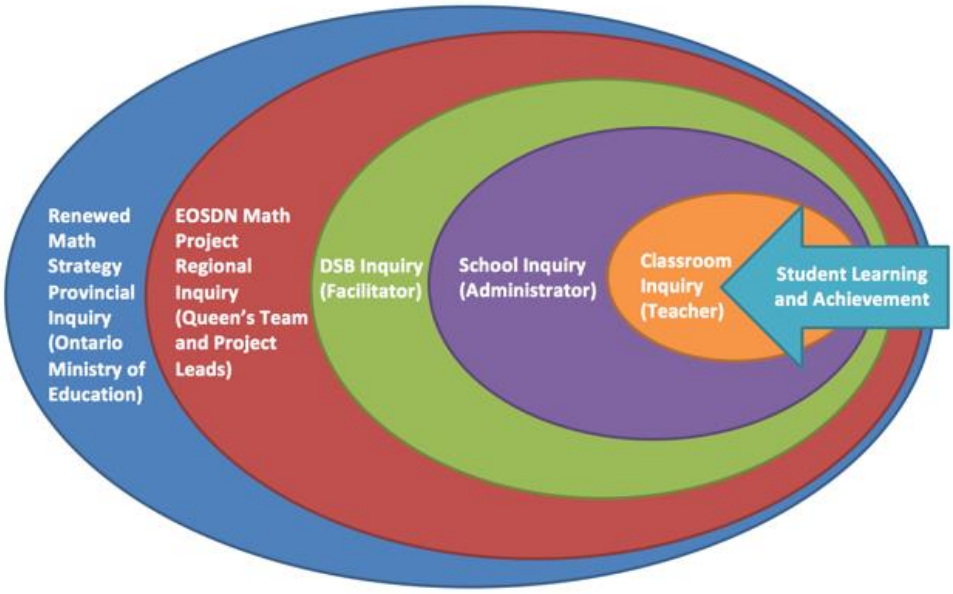

Figure 3. Nested regional inquiry model.

Table 3. *EOSDN Year 5 Math Project Inquiry Focus by DSB*

DSB	Project Inquiry Focus (Guiding Questions)
Algonquin Lakeshore Catholic (ALCDSB) ➢ Primary	How does using a Student Learner Profile impact teaching and learning in mathematics? If we increase educators' capacity in mathematics and cultivate collaborative leadership, will students' mathematical achievement increase?
Catholic DSB of Eastern Ontario (CDSBEO) ➢ Primary/Junior	How are continuums (additive to multiplicative) being used to inform teaching and learning across classrooms? How does analyzing student work on a continuum (additive to multiplicative) inform our intentional next steps for student learning?
Hastings Prince Edward (HPEDSB) ➢ Junior	How will developing learner profiles help educators respond to the needs of each learner through precise and personalized instruction, including accommodations, in mathematics? How will sitting beside students to listen and learn about their thinking around sense of number, support educators in uncovering student thinking and learning processes? How will student and teacher representation of thinking change as a result of this learning?
Limestone (LDSB) ➢ Primary ➢ Intermediate/Senior	How is student voice informing our next best move? How does staff use of key practices impact student learning? How are educators using data/evidence/voice to monitor the impact on student achievement in math? How will teachers document and share what they've learned about their students' conceptual understanding in math from year to year? How can we align the work of the EOSDN project, instructional coaching and the work of math leads?
Ottawa Carleton (OCDSB) ➢ Primary/Junior/ Intermediate	How can we continue to effectively use learner profiles (with consistent criteria - including student voice) to provide information on our students that inform our next steps in the teaching/learning process? How can we build knowledge and understanding on how to make documentation pedagogical?

Ottawa Catholic (OCSB) ➢ Primary	How are the educators involved in the project operationalizing the educator learning from our face-to-face professional learning sessions? Which aspects of our face-to-face sessions in foundational math concepts/mathematical content is best meeting the professional learning needs of our educators?
Renfrew Catholic (RCCDSB) ➢ Junior/Intermediate	How are educators involved in the project (i.e., facilitators, school administrators, and teachers) using student data to inform math teaching and learning in their schools and classrooms? Which key practices are having the most impact on the learning and achievement of *students of mystery* and others?
Renfrew County (RCDSB) ➢ Primary	If we extend our use of a **developmental continuum** to K-2 and include more educators, then more **precise instruction** can be planned across grades. If we provide opportunities for more educators to engage in planning based on **assessment** and pedagogical documentation for marker students, then educators will be able to reflect on these practices and how they might influence planning for extended groups of students. If we focus on the involvement of the special education teacher, then the learning can spread in to primary and junior classrooms. If we provide opportunities for teachers to engage deeply with evidence, then educators will be more proficient in planning for **precise instruction**. If we continue to monitor a variety of marker students, K-6, then educators will gain insight into the **precise** moves that will help to move all students forward.
Upper Canada (UCDSB) ➢ Primary	How are we determining the intended learning outcomes? What pre- and post-exploratory tasks are we selecting and how are we capturing students' representing their thinking in number sense? What intentional assessment or instructional moves around representing student thinking and building number sense are we choosing to address achievement gaps in learning (e.g. guided math group, explicit teaching, peer and self-assessment, think aloud, revisiting, and refining success criteria, etc.) and move student learning forward? What will I do if my student(s) meet(s) the criteria?

Impacts on Teaching and Learning

Impacts on teaching and learning were derived from educator participant surveys, project lead questionnaires, and data collected at regional sessions (i.e., documentation, photos, artifacts, exit surveys) and are presented according to impacts on: (a) instructional practice, (b) students, and (c) classroom culture.

Impacts on Instructional Practice

According to classroom teachers involved in the EMP, the project had the greatest impacts on their *development and use of learner profiles to support students of mystery in math*; *focus on leveraging students' strengths to support their needs in math (i.e., asset-based approach)*; and *use of tools to support students' thinking and representation in math (e.g., manipulatives, technology, visual representations)* (see Table 4).

Table 4. *Classroom Teachers' Mean (SD) Responses for Impacts on Instructional Practice*

	n = 24
Please indicate the extent to which your participation in the EOSDN Math Project has enhanced your:	
	M(SD)
Development and use of learner profiles to support students of mystery in math	4.21(.78)
Focus on leveraging students' strengths to support their needs in math (i.e., asset-based approach)	4.21(.78)
Differentiation of math instruction to meet students' needs	3.92(.88)
Understanding of math concepts on a conceptual continuum	3.71(1.00)
Ability to name and notice where students are at on a conceptual continuum of number sense	3.88(.68)
Focus on addressing gaps in students' conceptual understanding versus gaps in skills	3.83(.82)
Use of number talks to support students' math learning	3.71(1.00)
Use of multiple representations to support students' math learning (e.g., number lines, arrays, area models)	4.00(.78)
Use of thinking tasks to support students' math learning	3.87(.80)
Use of tools to support students' thinking and representation in math (e.g., manipulatives, tech, visual representations)	4.04(.69)
Implementation of assessment for, as, and of learning in math	3.71(1.08)
Documentation of students' math learning using multiple methods (e.g., paper-based and digital)	3.83(1.05)
Triangulation of multiple forms of evidence to inform math instruction	3.71(.91)

Note. Survey question 6. Five-point scale from 1 = None at all to 5 = A great deal. Highest means.

Qualitative data collected from the EMP educator participants across roles confirmed and elaborated impacts on classroom teachers in three key areas: use of learner profiles, purposeful assessment approaches, and precise instructional strategies.

Use of learner profiles. All EMP participants described classroom teachers' development and use of learner profiles to understand and support their *students of mystery* in math, a central element of the EMP in both Years 4 and 5. Teachers collaboratively developed and revised learner profiles with district facilitators and their school teams at designated regional EMP sessions throughout the year (i.e., November, February, and May). These learner profiles reflected students' strengths and needs, through an asset lens, incorporating both classroom assessment information (e.g., diagnostic assessments and documentation), as well as assessment information from other professionals (e.g., psychologists, speech and language pathologists). Profiles also included plans for precise instructional and assessment strategies to support and monitor students' learning, often in relation to a conceptual continuum or cognitive domains outlined YCDSD's *Supporting Students with Learning Disabilities in Mathematics*. District facilitators noted that as classroom teachers developed a greater understanding of conceptual continua, cognitive domains, and other assessment information, they were more able to develop and use learner profiles that supported their students' needs. As one district facilitator stated, "Being able to really dive deeply into the reports and understand what that means, and what it might look like in a student (and see how truly different each student is), has allowed for more reflective practice, and a search for tools that allow for more personalized and precise teaching and practice for each student." As such, with regional and school-embedded support from district facilitators and school support teachers, classroom teachers began to actively use learner profiles to guide instruction and assessment of their *students of mystery*. In addition, district facilitators helped classroom teachers update learner profiles as they learned more about their *students of mystery* over time, incorporating student voice into profiles where possible to capture students' awareness of their personal learning strengths and needs in math.

> *We need to start with student first—understand their Zone of Proximal Development before worrying about where they are at in the curriculum.*
>
> District Facilitator

> *I now use a wider variety of assessment formats to assess my students. I am looking to assess these students in order to move them along to the next step. I would say that I am assessing more 'for' learning and a little less 'of' learning.*
>
> Classroom Teacher

Purposeful assessment approaches. Through their involvement in the project and building on regional learning from previous EMP years, classroom teachers began to implement more purposeful assessment approaches to support and monitor the learning of their *students of mystery*. In most cases, district facilitators helped teachers implement diagnostic assessments (e.g., PRIME, DSB specific diagnostics, or open tasks) with *students of mystery* at the start of the project to determine students' strengths and needs. These diagnostic assessments informed students' learner profiles, allowing teachers to: (a) identify precise goals for students in relation to a conceptual continuum or identified learning goals/success criteria; (b) plan for and implement timely, precise instructional strategies to support students' learning; and (c) monitor students' progress toward goals

through ongoing assessment throughout the year.

Commonly, classroom teachers focused their assessments on documenting observations and conversations with *students of mystery* in relation to goals identified in learner profiles, providing insights into students' understanding of math concepts and their progress over time. In many cases, district facilitators helped teachers leverage technology to support their documentation (e.g., video, audio, Google, OneNote, online portfolios). In addition, district facilitators helped teachers analyze documentation triangulated with student work to determine next steps, many implementing the Collaborative Analysis of Students' Math Thinking (CASMT) approach. Through collaborative analysis of students' thinking, district facilitators helped classroom teachers *notice and name* the math in students' thinking and plan for next steps in instruction. For teachers leveraging a conceptual continuum, the continuum helped teachers understand the complexity of foundational number sense and assess students' understanding and misconceptions in nuanced ways, thus enabling precise next steps in instruction to move students along the continuum.

> *I'm focusing the structure of assessments on the "strengths" of the students, what they CAN do.... rather than the "needs" of the student and what they CAN'T do.*
>
> Classroom Teacher

Overall, classroom teachers involved in the project advocated formative over summative assessments to understand the thinking of *students of mystery* in math, with an asset lens. According to teachers, formative assessments more effectively informed targeted instruction to meet students' individual needs, elucidated students' progress and challenges over time, and allowed for deeper teacher reflection on the effectiveness of the instructional strategies they used. Some teachers described formative assessment as "more reliable" than summative assessments for *students of mystery*, with many endorsing one-on-one conferencing with *students of mystery* to understand their thinking, uncover possible misconceptions, and determine next steps in teaching and learning. Other teachers noted the importance of regular formative assessment with all students, recognizing that *students of mystery* may simply require more in-depth conferencing to uncover their current understanding and potential misconceptions.

Precise instructional strategies. Stemming from regional and school-embedded EMP learning, classroom teachers involved the project began to implement precise instructional strategies to support the learning of not only their *students of mystery* but also all students in their classrooms. The strategies most commonly implemented were tools to support learning and differentiated group instruction. Teachers increasingly used tools—generally manipulatives but also visual representations and technology—at the point of instruction, intentionally modelling how students might use manipulatives as thinking tools to develop and demonstrate conceptual understanding in math. Over time, many teachers realized that manipulatives supported the learning of all students. For example, one teacher stated, "I used to think that using manipulatives was important for my struggling students, however, in what I thought was a simple computation error, the use of manipulatives revealed there was a major learning gap in my perceived strong student." As such, teachers began to make a

> *Teachers are meeting the needs of some students and realizing it benefits all students.*
>
> District Facilitator

variety of tools readily available to students to support their learning and representation in math.

> *My practice looks different because I feel confident to say that*
> *I am more equipped to meet the needs of students with challenges*
> *by using the strategies and tools I was taught in this project.*
>
> Classroom Teacher

Teachers also began to use diagnostic assessment information to enable differentiated group instruction, with targeted interventions and strategies based on each group's identified strengths and needs. Differentiated group instruction enhanced precision of teachers' instruction for all students and allowed teachers to move away from reliance on one-on-one support focused on *students of mystery*. A district facilitator explained, "Ability groupings are responsive to student evidence and can allow for targeted instruction for specific gap closing." A teacher added, "I am much more focused on moving students forward up a developmental continuum as opposed to teaching everyone the same content in the same manner. I plan to continue to incorporate more small group instruction based on strengths/needs and reduce the amount of time I dedicate to whole group learning."

Impacts on Students and Classroom Culture

Classroom teachers reported various impacts of the EMP on their *students of mystery*. The greatest impacts they reported pertained to these students' *ability to use tools to support their thinking and representation*; *engagement during math class;* and *ability to identify their personal strengths and needs in math* (see Table 5). Classroom teachers reported the lowest impacts on students' *achievement of grade-level math curriculum expectations* and *ability to make connections among math concepts*. Although, all means for impacts on *students of mystery* were relatively low (range M = 3.00- 3.63; 5-point scale from 1 = none at all to 5 = a great deal scale) these reported impacts can be interpreted as positive because they reflect changes in students who have consistently struggled in math and may also have identified learning issues. Furthermore, systematic changes in these students' abilities to make connections among math concepts and their achievement of grade-level math expectations would take substantial time and collective effort among educators across roles and contexts.

Qualitative data collected across EMP participants further elaborated changes in *students of mystery* with respect to increased engagement, problem solving approaches, and demonstrating conceptual understanding.

Increased engagement. EMP educators who spent time in schools and classrooms (i.e., district facilitators, school administrators, school support teachers, and classroom teachers) described increased engagement among *students of mystery* during math class. Overall, these students were more confident in their learning, taking risks and persevering with math lessons and tasks in new ways by asking clarifying questions, accepting teacher feedback, collaborating with peers, learning from mistakes, and advocating for themselves according to their personal strengths and needs. District facilitators also observed that student voice was more prevalent in classrooms, with *students of mystery* sharing their thinking and naming the problem solving strategies they used. A teacher added, "Students are persevering and engaged in math processes more than meeting each specific expectation."

Table 5. *Classroom Teachers' Mean (SD) Responses for Impacts on Students of Mystery*

	n = 24
Please indicate the extent to which your participation in the EOSDN Math Project has enhanced these students':	
	M(SD)
Confidence and risk-taking with math tasks	3.37(.82)
Engagement during math class	3.48(.99)
Ability to identify their personal strengths and needs in math	3.46(1.10)
Understanding of math concepts (e.g., number sense, patterns, proportion)	3.38(.88)
Application of math strategies (e.g., using knowledge and skills in context)	3.21(.88)
Ability to represent math thinking in diverse ways (e.g., use of concrete materials, pictures, diagrams, numbers, words, and/or symbols)	3.33(.76)
Ability to communicate math thinking in multiple ways (e.g., orally, visually, and/or in writing)	3.33(.92)
Ability to use tools to support their thinking and representation (e.g., manipulatives, technology, visual representations)	3.63(.88)
Ability to make connections among math concepts	3.08(.83)
Achievement of grade-level math curriculum expectations	3.00(1.02)

Note. Survey question 5. Five-point scale from 1 = None at all to 5 = A great deal. Highest means. Lowest means.

Multiple problem solving approaches. According to district facilitators, school administrators, school support teachers, and classroom teachers, *students of mystery* became more comfortable and capable solving problems in various ways. In particular, *students of mystery* began to use tools—often manipulatives, but sometimes visual representations or technology—to solve math problems. Tools allowed students to solve problems in ways that aligned with the strengths and needs identified in their learner profiles, demonstrate their understanding of math concepts, and—with teacher or other educator support—identify their misconceptions with respect to math concepts. In many classrooms, the use of tools to solve math problems extended beyond *students of mystery* to all students. Interestingly, according to classroom teachers, the use of tools promoted a shift in classroom culture that was slightly greater than impacts on *students of mystery* themselves (see Table 6 versus Table 5).

> *Students are able to attain success once supports are put in place for them.*
>
> School Support Teacher

Demonstrating conceptual understanding. All EMP educator participants indicated that *students of mystery* began to demonstrate conceptual understanding in math, a focus of the project in Years 4 and 5. Through changes in classroom teachers' approaches to instruction and assessment, *students of mystery* were provided with opportunities to demonstrate their understanding of math concepts through teachers' documentation of observations and conversations for formative purposes, with less emphasis on demonstrating achievement of curriculum expectations through paper-pencil products for summative purposes. Collecting and collaboratively analyzing multiple sources of

student data sources over time (i.e., observations, conversations, and products), with an emphasis on students' conceptual understanding, provided evidence of slow but steady gains among students, often along a developmental continuum. As one teacher stated, "My students are making progress. I see greater application in terms of my students sharing their ideas and what they are able to report on. We have written and oral evidence of different strategies being used and many are being successful on a more consistent basis."

Table 6. *Classroom Teachers' Mean (SD) Responses for Impacts on Classroom Math Culture*

	n = 24
Please indicate the extent to which your participation in the EOSDN Math Project has impacted the following aspects of classroom math culture:	
	M(SD)
Valuing risk taking and learning from mistakes in math	3.83(.92)
Focusing on thinking and understanding different approaches to solving math problems	3.96(.81)
Valuing student voice in math discourse	3.96(.91)
Students using tools to support learning (e.g., manipulatives, technology, visual representations)	4.08(.88)
Students solving problems collaboratively	3.83(.96)

Note. Survey question 7. Five-point scale from 1 = None at all to 5 = A great deal. Highest mean.

My students have a greater comfort level in approaching new concepts and are more confident in asking questions and sharing ideas. All of my students seem comfortable finding a starting point, regardless of their own abilities. I see a very diverse range of strategies and many of these students are taking risks and trying new ideas for themselves.

~Classroom Teacher

Impacts on Spread and Sustainability

Impacts on spread and sustainability were derived from educator participant surveys, project lead questionnaires, and data collected at regional sessions (i.e., documentation, photos, artifacts, exit surveys). Impacts are presented according to impacts on: (a) school math culture, and (b) DSB math culture.

Impacts on School Math Culture

According to district facilitators, school administrators, and support teachers, the EMP had the greatest impacts on *educators using common approaches to support students' math learning*; *educators developing, using, and refining learner profiles to support responsive instruction of students of mystery*; and *educators using common math language to name and notice students' learning* (see Table 7). These impacts were evident among educators officially involved in the EMP and also began to spread within and across schools to educators not officially involved in the project.

Table 7. *Mean (SD) Responses for Impacts on School Math Culture according to District Facilitators, School Administrators, and Support Teachers*

	n = 39
Please indicate the extent to which your participation in the EOSDN Math Project has impacted the following aspects of school math culture:	
	M(SD)
Educators sharing ownership of students' math learning across classrooms	3.74(.99)
Educators making connections in math curriculum content across grades	3.67(.96)
Educators developing, using, and refining learner profiles to support responsive instruction of students of mystery	4.18(.90)
Educators implementing asset-based approaches to math teaching and learning across classrooms	3.97(.81)
Educators using common math language to name and notice students' learning	4.13(.83)
Educators using common approaches to support students' math learning (e.g., number talks, manipulatives, technology)	4.21(.80)
School support teachers spreading common math language and instructional approaches across classrooms	3.87(1.13)

Note. Survey question 8. Five-point scale from 1 = None at all to 5 = A great deal. Highest means.

Qualitative data collected from EMP participants across roles further elaborated impacts of the project on school math culture.

Common approaches across classrooms. All EMP participants explained that common approaches endorsed by the project began to spread among school-based educators—primarily classroom teachers—not officially involved in the EMP. The pedagogical approaches most commonly reported were: developing and using learner profiles to support *students of mystery*;

focusing on number sense and numeration; using common resources (e.g., Alex Lawson's *What to Look For*, YCDSB's *Supporting Students with LD in Mathematics*, and YRDSB's *Understanding Learning Disabilities: How Processing Affects Learning Waterfall Chart*); and leveraging manipulatives to support students' learning and representation. In addition, EMP educators spoke about common approaches to assessment used across classrooms including pedagogical documentation, the CASMT approach, and diagnostic assessments (e.g., PRIME)—all with an emphasis on assessing students' understanding along a conceptual continuum rather than students' achievement of isolated curriculum expectations. According to project leads and district facilitators, the EMP endorsed clear, practical approaches to instruction and assessment that could be readily spread among classroom teachers through school-based educators (i.e., school administrators, school support teachers, and classroom teachers) involved in the project.

Collaborative leadership in schools. Common approaches to instruction and assessment were introduced to district and school-based EMP participants at regional sessions then spread to other educators in schools through collaborative leadership among EMP participants. In many cases, district math facilitators and school-based EMP educators (i.e., school administrators, school support teachers, and classroom teachers) co-facilitated staff meetings or school-based professional learning sessions in which they introduced EMP approaches to their school-based colleagues (e.g., developing learner profiles for *students of mystery*, leveraging conceptual continua, using CASMT, implementing number talks) and shared their experiences with these approaches. In several schools, every classroom teacher identified two or three *students of mystery* and developed learner profiles to support these students throughout the school year. At the end of the school year, these learner profiles were passed on the students' subsequent teachers to support students' transitions across grades.

> *I have observed educators reflecting on their practices and their students' needs. They are more willing to share their thinking about their students and supporting each other in finding ways to meet their students' needs by being vulnerable [to each other].*
>
> District Facilitator

In several schools, spread of common approaches also occurred through school support teachers. School support teachers took on active leadership roles supporting classroom teachers' implementation of new approaches in classrooms with students—this included EMP classroom teachers as well as teachers not officially involved in the project. School support teachers leveraged learning from regional EMP sessions and partnerships with district facilitators in order to help classroom teachers and their students use strategies and tools more purposefully to support math learning. Moreover, support teachers promoted the message that "what is necessary for some is good for all" among teachers and students in the classroom context.

As EMP approaches to instruction and assessment spread in schools, classroom teachers began to collaborate more with grade or divisional colleagues. It appeared that common approaches endorsed by the project enabled purposeful collaboration and reflection among EMP educators. In several schools, teachers across grades and divisions also began to learn from each other. For example, in one case, Grade 7/8 teachers learned about high school math curriculum from Grade 9 teachers, while Grade 9 teachers learned about learner profiles from Grade 7/8 teachers.

School administrator engagement. According to project leads and district facilitators, engaging school administrators as co-learners in regional EMP sessions was "imperative" to spread and sustainability of EMP approaches in schools. At regional sessions and through ongoing collaboration with district facilitators, school administrators gained foundational knowledge about math pedagogy and learner profiles, allowing administrators to support and spread EMP approaches among educators in their schools when district facilitators were not present. School administrators used knowledge gained at regional sessions to inform school-based staff meetings and professional learning sessions, promote the use of common approaches and templates across classrooms (e.g., learner profiles, CASMT, manipulatives), and guide their own *noticing and naming* of math pedagogy and learning during visits to classrooms. In some cases, school administrators used RMS funding for release time to enable spread of EMP learning among educators in schools. A few school administrators also developed school profiles and used EMP goals to inform their SIPSAs.

> *We realize the value of a team working together in building a common understanding through thought-provoking discussions, moderation of student work, debriefing, questioning, and reflecting together to move the learning forward.*
>
> School Administrator

Collective ownership. Common approaches, collaborative leadership, and school administrator engagement contributed to educators' collective ownership of students' math learning in schools. District facilitators, school administrators, support teachers, and classroom teachers involved in the EMP consistently conveyed the belief that all educators collectively owned the learning of each *student of mystery*, and increasingly, the learning of all students in their respective schools. In many EMP schools, this belief began to spread among all classroom teachers, not just those involved in the project. Learner profiles enabled collective ownership because profiles were collaboratively developed and updated by all educators who worked with a student (i.e., classroom teacher, support teachers, school administrator, district facilitator) and were used to support that student's transitions across grades. In a few schools, students were grouped across classrooms based on their learner profiles to target students' needs through purposefully designed activities. Cross-divisional sharing was also promoted in some schools to spread learning among classroom teachers and promote collective ownership across grades and transitions between divisions.

Impacts on DSB Math Culture

With respect to DSB math culture, district facilitators reported that the EMP had the greatest impacts on *integrating EMP goals with RMS and BIPSA goals* and *implementing central professional development sessions focused on EMP goals* (see Table 8).

Table 8. *District Facilitators' Mean (SD) Responses Impacts on DSB Math Culture*

	n = 21
Please indicate the extent to which your participation in the EOSDN Math Project has impacted the following aspects of DSB math culture:	
	M(SD)
Integrating EOSDN Math Project goals with RMS and BIPSA goals	4.19(1.03)
Fostering collaboration among DSB educators across departments (i.e., Curriculum, Special Education, Technology)	3.95(1.02)
Implementing central professional development sessions focused on EOSDN Math Project goals (e.g., learner profiles, pedagogical documentation, math curriculum, assessment, growth mindset, manipulatives, technology)	4.05(.92)
Spreading learning to schools outside the EOSDN Math Project through Special Education system leads and school support teachers	3.71(1.15)

Note. Survey question 9. Five-point scale from 1 = None at all to 5 = A great deal. Highest means.

Qualitative data collected from district facilitators confirmed and further elaborated EMP impacts on DSB math culture.

Partnerships across departments. For the past two years, the EMP has provided regular opportunities for district facilitators across departments—math and special education leads—to collaborate at regional sessions. These unique opportunities for collaborative learning, discussion, and planning among district facilitators has contributed to district facilitators' understanding of each department's unique roles and responsibilities. Specifically, over the past two years, math leads have learned about special education and learner profiles from special education leads, while special education leads have learned about math curriculum and pedagogy from math leads. Consequently, according to one district facilitator, "We all feel more confident sharing with and supporting the teachers we work with." Partnerships cultivated at regional EMP sessions have extended into district facilitators' work within their DSBs, with math and special education leads regularly collaborating to support educators and students through both central and school-embedded professional learning sessions for educators. In addition, math and special education leads have collectively advocated a common approach to math teaching and learning to system administrators, rooted in EMP learning and experiences, contributing to increased coherence and alignment among BIPSA goals and initiatives.

Coherence across BIPSA goals and initiatives. In many DSBs, BIPSA goals currently reflect and align with both RMS and EMP priorities. As such, DSBs, informed and supported by math and special education leads, have initiated a variety of central sessions that concurrently support BIPSA, EMP, and RMS goals. Across DSBs, central sessions have focused on topics such as understanding

We are honouring EQAO data but are not waiting for it—no one holds their breath waiting in September when kids can't read…

District Facilitator

learning disabilities in math, developing learner profiles to support *students of mystery* in math, using the *What to Look For* developmental continuum, and implementing number talks. In some cases, EMP participants have co-facilitated central sessions with district facilitators, demonstrating collaborative leadership by sharing their personal experiences with EMP strategies. In addition, central sessions have also targeted various groups of educators to promote spread in DSBs including school support teachers via special education leads and new teachers via NTIP. Moreover, in several DSBs, EMP district facilitators have promoted the purposeful use of data, both qualitative and quantitative, to support ongoing learning among educators and students within their districts.

Common approaches across schools. Through partnerships across departments and coherence across BIPSA goals and initiatives, common approaches are emerging across schools in DSBs. While DSBs involved in the EMP supported a limited number of schools through the project (i.e., 2-8 schools per DSB), EMP strategies were increasingly evident in schools not officially involved in the project. Building on positive experiences among Year 4 EMP participants, the most common approach district facilitators reported had spread across schools was developing learner profiles for *students of mystery*. In some DSBs, all classroom teachers across all schools developed a learner profile for two or three *students of mystery* and monitored the learning of these students throughout the current school year. In some DSBs, classroom assessment data for these students was used to inform and monitor system supports.

The learner profile has become the heart of the system.

~District Facilitator

Factors that Contributed to Impacts on Educators and Students

Factors that contributed to impacts on educators were primarily derived from educators' responses to survey Question 4, triangulated with qualitative data from regional sessions (i.e., documentation, photos, artifacts, exit surveys).

Table 9 summarizes EMP educator participants' mean responses to the 18 items associated with survey Question 4 (*Thinking about the EOSDN Math project, please indicate the extent to which each of the following factors has impacted your thinking and/or practice as an educator.)*, grouped according to the three themes broad themes—FOCUS, ENACTMENT, SUPPORTS—and 10 categories identified in the professional learning framework developed by LaPointe-McEwan and colleagues (2018) (see p. 2). Factors that contributed to impacts on EMP educators are discussed in relation to the three themes and associated categories (see Figure 4), as well individual survey items, for the full sample as well as classroom teacher and other educator subgroups.

FOCUS	ENACTMENT	SUPPORTS
1. Relevant Content 2. Student Outcomes 3. Coherence and Alignment	4. Job-embedded Collaboration 5. Sustained Momentum 6. Active Learning	7. Networked Leadership 8. Knowledgeable Others 9. Trust and Respect 10. Resources and Tools

Figure 4. Themes and categories of factors that impact educators' professional learning.

In the full sample, the five factors that contributed most to EMP participants' learning were:

- *trusting professional relationships among educators in my team* (SUPPORTS-trust and respect)
- *prioritizing connections between educator practice and student outcomes* (FOCUS-student outcomes)
- *reflecting on how students interact with math content and pedagogy* (FOCUS-student outcomes)
- *focusing on relevant content and pedagogical knowledge* (FOCUS-relevant content)
- *connecting content and pedagogical knowledge to classroom implementation* (FOCUS-relevant content)

The importance of the above factors were consistent for classroom teacher and other educator subgroups with three exceptions. First, while important for both subgroups, t*rusting professional relationships among educators in my team* (SUPPORTS-trust and respect) supported classroom teachers more than educators in other roles. Second, *connecting math content and pedagogical knowledge to classroom implementation* supported educators in other roles more than classroom teachers (FOCUS-student outcomes). Third, *ongoing support from knowledgeable others* supported educators in other roles more than classroom teachers (SUPPORTS-knowledgeable others). These findings highlight that although educators across roles are supported by many common aspects of professional learning opportunities, they also require role-specific supports.

While all means for the full sample, as well as classroom teacher and other educator subgroups, were relatively high (range M = 3.38-4.38; 5-point scale from 1 = none at all to 5 = a great deal scale), it is important to note the mean responses of other educators were generally higher than the

mean responses of classroom teachers (see Table 9). In addition, *aligning our inquiry with system priorities* (i.e., DSB or province) and *local priorities* (i.e., student or educator) (FOCUS-coherence and alignment) were more important to educators in other roles than to classroom teachers. These findings suggest that educators in other roles are more connected to leveraging professional inquiry across contexts to support school, DSB, regional, and provincial priorities (see Figure 3), while classroom teachers tend to be more focused on classroom priorities (i.e., teaching and learning).

Interestingly, *learning collaboratively with colleagues from other DSBs at regional sessions* (ENACTMENT-job-embedded collaboration) made a relatively low contribution to educator participants' learning, and was lower for classroom teachers than for educators in other roles. Qualitative data collected from EMP educator participants clarified that district facilitators particularly valued opportunities for cross-DSB collaboration at regional meetings, while school-based educators (e.g., school administrators, school support teachers, and classroom teachers) were more supported by collaboration with their DSB team at regional sessions. All educator participants offered suggestions to enhance opportunities for collaboration—both within and across DSBs—at regional sessions (see p. 38).

Taken together, these findings regarding factors that contributed impacts on educators and students highlight that **trust and respect** in conjunction with a focus on **relevant content** and **student outcomes** supported by **knowledgeable others** were important to all educators' learning within the EMP. Moreover, findings indicated that educators who support the work of classroom teachers prioritized different aspects of professional learning than classroom teachers—including latitude of the EMP to enable **coherence and alignment** of DSB inquiries with local priorities—and therefore required differentiated learning opportunities (e.g., role-specific capacity building and cross-DSB networking at regional sessions).

It is necessary to provide both common and differentiated learning opportunities for educators across roles supported by relevant experts.

Project Lead

Relevant professional learning places current professional thinking and action within the context of the wisdom of the profession. It is both research-informed and practice-informed. It acknowledges the professional within the profession.

~Project Lead

Table 9. *Mean (SD) Responses for Factors that Impacted Educator Participants Thinking and Practice*

Please indicate the extent to which each of the following factors has impacted your thinking and/or practice as an educator. *(5-point scale from 1 = none at all to 5 = a great deal)*			Full Sample	Classroom Teachers	Educators in Other Roles
			n = 62	n = 25	n = 37
			Mean(SD)	*Mean(SD)*	*Mean(SD)*
FOCUS	1	Focusing on relevant math content and pedagogical knowledge	4.26(.77)	4.12(.78)	4.35(.75)
		Connecting math content and pedagogical knowledge to classroom implementation	4.26(.79)	4.08(.81)	4.38(.76)
	2	Prioritizing connections between educator practice and student outcomes in math	4.27(.81)	4.16(.90)	4.35(.75)
		Reflecting on how students interact with math content and pedagogy	4.27(.79)	4.16(.85)	4.35(.75)
	3	Aligning our inquiry with local priorities (i.e., student or educator)	3.95(.97)	3.52(.87)*	4.24(.93)*
		Aligning our inquiry with system priorities (i.e., DSB or province)	3.62(1.08)	3.38(.97)	3.78(1.13)
ENACTMENT	4	Learning collaboratively with my team at regional sessions	4.23(.82)	4.08(.78)	4.32(.85)
		Learning collaboratively with colleagues from other DSBs at regional sessions	3.74(1.11)	3.48(.99)	3.91(1.17)
		Learning collaboratively with my team in our context of practice	4.08(.82)	4.04(.79)	4.11(.84)
	5	Engaging in sustained collaborative inquiry for one academic year	4.06(.81)	4.08(.70)	4.05(.88)
	6	Exploring our professional practice via collaborative inquiry	4.00(.89)	4.08(.76)	3.95(.97)
		Collaboratively analyzing relevant data from practice with my inquiry team	4.05(.80)	3.96(.68)	4.11(.88)
		Prioritizing evidence from practice to inform our inquiry team's next steps	3.97(.92)	3.96(.68)	3.97(1.04)
SUPPORTS	7	Ongoing support from leaders in my school and/or DSB	4.12(.76)	4.08(.78)	4.14(.76)
	8	Ongoing support from knowledgeable others (e.g., math & special education experts, researchers)	4.23(.91)	4.04(.89)	4.35(.92)
	9	Trusting professional relationships among educators in my team	4.30(.80)	4.24(.72)	4.33(.86)
	10	Job-embedded release time to collaborate with my team	4.02(.99)	3.92(.86)	4.08(1.08)
		Frameworks to support our collaborative inquiry (e.g., planning, reporting)	3.79(.89)	3.72(.89)	3.84(.90)

Note. Highest 3 means; Lowest 3 means. * = significant differences. Numbers 1-10 represent categories for each theme. No individual survey items were specific to ENACTMENT-Differentiated Opportunities.

Suggestions Moving Forward

EMP educator participants offered suggestions moving forward into 2018-2019. Suggestions are organized according to: (a) aspects of the project to maintain; and (b) opportunities to enhance regional learning.

Aspects of the Project to Maintain

Several aspects of the project to maintain were consistent across all educator participant groups, while some were only articulated by district facilitators and project leads.

Across all of the educator participants, six aspects of the EMP were commonly identified as important to maintain.

- math expert support at regional sessions with direct connections to classroom practice and students' learning
- focus on common approaches (e.g., learner profiles for *students of mystery*, CASMT, *What to Look For*, *Waterfall Chart*, manipulatives)
- educators learning the math by doing the math
- focus on *students of mystery*
- time to create and revise learner profiles at regional sessions
- time for school-embedded support
    - create and refine learner profiles
    - implement new strategies/tasks with students in classrooms
    - collaboratively assess students' learning

In addition, the district facilitators and project leads identified eight further aspects to maintain.

- monthly regional Steering Committee meetings for within and cross-DSB learning and discussion
- inclusion of special education leads at all regional sessions
- regional sessions for full DSB teams (district and school-based educators)
- purposeful cross-DSB and like role networking at regional sessions
- purposeful involvement of school-based educators (school administrators, school support teachers, and selected classroom teachers)
- researcher support of EMP activities
- focus on evidence-informed professional learning and practice (both research- and practice-based evidence)
- asset approach to EMP, emphasizing "growth not perfection"

Our monthly meetings have been invaluable for Steering Committee professional development as well as having an opportunity to share resources or ask for suggestions from boards that might have already implemented something.

~District Facilitator

Opportunities to Enhance Regional Learning

District facilitators and project leads offered suggestions to enhance learning opportunities for educators in schools and DSBs across the region.

Expand the learner profile approach.

- explore strategies to update learner profiles regularly, as educators learn more about *students of mystery*
- further explore strategies to incorporate student voice into learner profiles (e.g., interviews and conferencing)
- consider the use of technology and the physical learning environment in learner profiles
- further explore how learner profiles can be used to plan for instruction, write precise IEPs, and support students across all classrooms, not just EMP classrooms
- use the learner profile approach to inform Universal Design for Learning (UDL)

Go deeper with the current learning within schools, DSBs, and the region.

- continue to explore how tools—manipulatives, visual representations, technology—can be used purposefully by educators and students to support students' math learning and representation of math concepts
- explore resources linked to *What to Look For*
- go deeper with understanding and implementing the *Waterfall Chart*
- focus on strategies and accommodations that are appropriate for a variety of math tasks

Refine the structure of regional sessions.

- incorporate more time for DSB team discussions, planning, and reflection and for purposeful cross-DSB and like role networking
- continue to use technology to share regional resources (e.g., PowerPoints, documents) in advance of, during, and following regional sessions
- connect school-based educators with relevant virtual learning opportunities, in light of occasional teacher shortage (e.g., RMS virtual sessions)
- engage district facilitators in a review of professional learning literature
- revisit key capacities of middle leaders with district facilitators

Section 5: Key Findings and Recommendations

The Year 5 evaluation report contributes practice-based evidence, supported by current and ongoing research, to a growing body of knowledge regarding the systemic elements and structures that support evidence-informed, networked professional learning facilitated by middle leaders. Specifically, this collaborative developmental evaluation of the EOSDN Math Project (EMP) at the end of Year 5 (Phase 6) indicates that the project continues to be a valuable process to support math teaching and learning among educators across the nine DSBs in the Eastern Ontario region. In particular, our Year 5 findings contribute evidence regarding the importance of: (a) regional professional learning focused on common content and instructional approaches that support student outcomes, (b) ongoing, evidence-informed professional learning embedded in educators' contexts of practice, (c) knowledgeable other support of regional learning and exploration of new learning and approaches, and (d) collaborative leadership among educators across contexts to spread new learning and approaches in systems.

In Year 5, our findings provide further regional evidence regarding the critical role middle leaders play in facilitating evidence-informed, networked professional learning across classrooms, schools, and systems (e.g., Fullan, 2015; Killion, 2012; LaPointe-McEwan, et al., 2017). Moreover, as in Year 4, we augment Guskey's (2014) work by illustrating that a precise, regional focus on understanding, supporting, and monitoring the learning needs of *students of mystery*, facilitated by data literate middle leaders who recognize the value of both quantitative and qualitative classroom data, may accelerate intended impacts on students and/or make impacts on students more readily apparent in networked professional learning initiatives. Our findings also illustrate that sustained involvement of educators across roles coupled with a common regional focus, aligned with both local and systemic priorities, enables the spread of professional learning across classrooms, schools, and districts, a longstanding challenge in networked professional learning (e.g., Opfer & Pedder, 2011). In addition, these Year 5 findings provide practice-based evidence supporting Kennedy's (2016) assertion that effective professional learning places learning about relevant curriculum content within a focus on improving student outcomes, helps educators develop practice-based strategies and insights, and supports educators' capacity to apply new learning and make professional judgements on behalf of students in classrooms.

Data collected from all EMP participants highlighted important shifts in educators' understanding and use of common approaches to support *students of mystery* in math and increasing spread of EMP approaches within and across schools and DSBs through collaborative leadership amongst EMP participants across roles. Our overall findings for the EMP provide support for its continuation. At the same time, our evaluation and research have also generated important knowledge that will help to refine the EMP as it moves forward into its sixth year. The key findings below highlight the factors that appear to have contributed most to impacts on regional math teaching and learning in Year 5 of the EMP.

Key Findings in Year 5: What matters most to participants' learning?

1. ***Promoting Common Approaches:*** The regional project promoted common approaches to math teaching and learning, nested within provincial RMS priorities, enabling a common language among educators and the spread of approaches in classrooms, schools, and DSBs across the region.

   Building on Year 4 regional learning, the EMP continued to promote common approaches to math teaching and learning in Year 5. These approaches were aligned with provincial RMS priorities and included: developing and using learner profiles to support students struggling in math (i.e., *students of mystery*), using diagnostics and ongoing formative assessments to monitor students' progress and inform instruction, using tools (i.e., manipulatives, visual representations, and technology) to support students' learning and representation of thinking, implementing differentiated group instruction, and collaboratively analyzing students' thinking (e.g., CASMT). Common regional approaches provided a unified focus for regional sessions and tangible strategies that could be spread by EMP participants to other educators in their schools and DSBs.

2. ***Regional Capacity Building:*** Providing differentiated opportunities for regional capacity building supported by knowledgeable others helped educators across roles explore and apply new learning during regional sessions and within their respective contexts of practice.

   In Year 5, the EMP responded to Year 4 participants' desires for regional capacity building sessions focused on supporting *students of mystery* in math. Relevant knowledgeable others led purposefully planned regional sessions, differentiated according to educators' roles as well as their articulated needs and interests. Some regional sessions involved all EMP participants (e.g., November and February with Connie Quadrini regarding supporting *students of mystery* in math). Other regional sessions involved only district facilitators (e.g., January with Christine Suurtamm regarding supporting students in Grade 9 Applied Math; March and June with Heather Wark to explore Alex Lawon's *What to Look For*). These regional capacity building sessions supported by knowledgeable others provided valued opportunities for DSB teams involved in the project to collaboratively explore and apply new learning. Moreover, knowledgeable others scaffolded math content and pedagogical knowledge to enable EMP participants' implementation of new learning in-between regional sessions.

3. ***Sustained Educator Engagement:*** Continuing to involve Year 4 educators and schools in the project enabled depth and spread of learning and promoted collaborative leadership among educators within and across schools in DSBs.

   Year 5 built on the learning momentum of the previous year by continuing to engage Year 4 educators and schools, while doubling the overall number of educators and schools involved in the project (i.e., from 21 to 42 schools in Year 5). As in Year 4, district facilitator teams included math and special education leads from each DSB, while school teams involved one school administrator, one school support teacher, and two classroom teachers. The continued involvement of Year 4 educators in Year 5 allowed them to go deeper with their learning and further explore implementation of new strategies with students. In addition, Year 4 participants collaboratively supported the learning of new EMP participants at Year 5 regional sessions and

began to more actively spread EMP learning and approaches in schools across their DSBs. This included district facilitators spreading EMP learning via DSB-based professional learning sessions and their ongoing work with educators in schools. In addition, Year 4 school-based educators spread project learning to their colleagues not officially involved in the project via staff meetings or other school- and classroom-embedded professional learning activities. In these ways, educator participants in their second year of the project demonstrated collaborative leadership in Year 5 that promoted spread of EMP learning and approaches within and across schools in DSBs.

4. ***Focus on Conceptual Understanding:*** Focusing on students' development of conceptual understanding in math enabled related shifts in instructional practice, assessment approaches, and classroom culture.

   Stemming from Year 4 learning, EMP participants continued to explore and support students' development of conceptual understanding in math. The focus on students' conceptual understanding promoted related shifts in instructional practice and assessment approaches that went beyond teaching isolated, grade-level curriculum expectations to supporting and monitoring students' progression along conceptual continua.While educators initially focused on conceptual understanding among *students of mystery*, they began to extend this focus to all students in their classrooms. Educators implemented a variety of strategies and assessments to support students' conceptual understanding in math, providing students with multiple opportunities to demonstrate understandings and misconceptions through observations, conversations, and products. Educators also modelled and promoted the use of tools (e.g., manipulatives, visual representations, and/or technology), promoting a shift in classroom culture toward all students using tools to solve problems and represent their thinking.

5. ***School-embedded Support:*** District facilitators, school administrators, school support teachers, and classroom teachers involved in the project supported each other's implementation of new strategies in classrooms and collaboratively spread strategies to colleagues within schools.

   Year 5 built on the whole-school approach endorsed during Year 4 of the project by including school administrators, support teachers, and selected classroom teachers from each school at regional sessions. Regional sessions provided valued opportunities for school-based educators to learn and plan collaboratively with district facilitators. However, as in past years, school-based educators valued embedded support from district facilitators to help them implement new strategies with students in their classrooms. This was particularly important for school teams new to the project in Year 5. In addition, district facilitators helped school teams plan and conduct staff meetings and other school-based professional learning activities to spread EMP learning to their colleagues. District facilitators also provided differentiated support to school administrators and school support teachers within the school context; these educators played pivotal roles in fostering the spread of EMP learning.

Key Recommendations after Year 5

The following four recommendations have been identified to guide next steps for the EMP in Year 6 (2018-2019).

1. Build on and refine regional capacity building opportunities.

EMP educators benefit from regional capacity building, rooted in provincial priorities (i.e., the RMS) and supported by relevant knowledgeable others. In Year 6, EMP educators would likely benefit from deeper exploration of: *What to Look For* and related practical resources, using tools to support teaching and learning, applying the *Waterfall Chart* to enhance instruction and assessment, and extending the *student of mystery* approach to inform Universal Design for Learning (UDL) to support all students' learning. In addition, it would be useful to revisit the key capacities of effective middle leaders facilitators, to reflect on how facilitators' practice has evolved and to describe clearly the factors that contribute to success in supporting the learning of educator colleagues.

2. Maintain current educator participants and schools.

In Year 5 of the EMP, participants reported emerging spread of EMP approaches within and across schools and DSBs in the region. It will be important to sustain this momentum by maintaining the involvement of current educator participants and schools in Year 6. This will allow EMP participants across roles to continue to spread project learning to colleagues in their DSBs and schools through collaborative leadership and local professional learning sessions.

3. Leverage technology to support regional educator learning as appropriate.

In Year 6, the EMP should consider leveraging virtual sessions in conjunction with face-to-face sessions to support educator participants' learning. Face-to-face regional sessions are valued by both regional and school participants and monthly regional learning continues to be feasible for district facilitators. Smaller more locally based face-to-face sessions coupled with the strategic use of virtual learning resources may be appropriate support for school-based educators (i.e., school administrators, school support teachers, and classroom teachers), particularly given the challenges of releasing classroom teachers for professional learning.

4. Provide additional opportunities for facilitated learning in schools.

Shifting to more locally situated sessions for school-based participants means that it will be increasingly important for district facilitators to provide embedded support of school-based educators' implementation of project learning. School-based support may include: helping teachers create and use learner profiles to support *students of mystery*, using tools to support teaching and learning, and implementing new approaches to assessment. This support pertains not only to teachers in classrooms, but also to school support teachers who are fostering spread through their work across classrooms and school administrators who are leading learning in staff meetings and other school-based initiatives.

Key References

Avalos, B. (2011). Teacher professional development in *Teaching and Teacher Education* over ten years. *Teaching and Teacher Education, 27*, 10–20.

Bore, A., & Wright, N. (2009). The wicked and complex in education: Developing a transdisciplinary perspective for policy formulation, implementation and professional practice. *Journal of Education for Teaching*, *35*(3), 241–256.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher, 33*, 3–15.

Bryk, A. (2015). Accelerating how to learn to improve. *Educational Researcher*, *44*(9), 467–477.

Campbell, C., & Levin, B. (2009). Using data to support educational improvement. *Educational Assessment, Evaluation and Accountability*, *21*(1), 47-65. doi: 10.1007/s11092-008-9063-x.

Campbell, C., Osmond-Johnson, P., Faubert, B., Zeichner, K., & Hobbs-Johnson, A. (with Brown, S., DaCosta, P., Hales, A., Kuehn, L., Sohn, J., & Steffensen, K.). (2017). *The state of educators' professional learning in Canada: Final research report.* Oxford, OH: Learning Forward.

Chappuis, S., Chappuis, J., & Stiggins, R. (2009). Supporting Teacher. *Educational Leadership*, 56–60.

Cochran-Smith, M., & Lytle, S. L. (2002). Teacher learning communities. In James Guthrie (Ed.), *Encyclopedia of Education*. New York, NY: Macmillan Publishing Company.

Cochran-Smith, M., & Lytle, S. L. (2009). Inquiry as stance: Practitioner research for the Next Generation. New York, NY: Teachers College Press.

Cordingley, P., Bell, M., Thomason, S., & Firth, A. (2005). *The impact of collaborative continuing professional development (CPD) on classroom teaching and learning. Review: How do collaborative and sustained CPD and sustained but not collaborative CPD affect teaching and learning?* London, UK: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Darling-Hammond, L. (2010). Teacher education and the American future. *Journal of Teacher Education, 61*, 35–47.

Davis, B., & Sumara, D. J. (2006). *Complexity and education: Inquiries into learning, teaching, and research.* New York, NY: Routledge.

DeLuca, C., Shulha, J., Luhanga, U., Shulha, L. M., Klinger, D. A., & Christou, T. (2015). Collaborative inquiry as a professional learning structure for educators: A scoping review. *Professional Development in Education, 41*(1), 640–670.

Desimone, L. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher, 38,* 181–199.

Desimone, L. & Garet, M. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society, & Education, 7*(3), 252–263.

Donohoo, J. (2013). *Collaborative Inquiry for Educators: A Facilitator's Guide to School Improvement*. Thousand Oaks, CA: Corwin.

Earl, L., & Katz, S. (2006). Leading in a Data Rich World: Harnessing Data for School Improvement. Thousand Oaks, CA: Corwin.

Elmore, R. F. (2004). *School reform from the inside out: Policy, practice, and performance.* Cambridge, MA: Harvard Education Press.

Fullan, M. (2007). *The new meaning of educational change*. New York, NY: Routledge.

Fullan, M. (2009). Large-scale reform comes of age. *Journal of Educational Change, 10,* 101–113.

Fullan, M. (2015). Leadership from the middle: A system strategy. *Education Canada,* 22–26.

Fullan, M., & Knight, J. (2011). Coaches as system leaders. *Educational Leadership,* 50–53.

Guskey, T. (2014). Measuring the effectiveness of educators' professional development. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education* (pp. 447-466). New York, NY: Guilford Press.

Guskey, T., & Yoon, K. (2009). What works in professional development. *Phi Delta Kappan, 90,* 495–500.

Hargreaves, A., & Ainscow, M. (2015). The top and bottom of leadership and change. Phi Delta Kappan, 97(3), 42-48.

Hattie, J. (2013). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Katz, S., & Earl, L. (2010). Learning about networked learning communities. School *Effectiveness and School Improvement, 21*, 27–51.

Kennedy, M. M. (2016). How does professional development improve teaching? Review of Educational Research, 86(4), 945-980. doi: 10.3102/0034654315626800

Kennedy, A., Deuel, A., Nelson, T. H., & Slavit, D. (2011). Requiring Collaboration or Distributing Leadership?. *Phi Delta Kappan, 92*(8), 20–24.

Killion, J. (2012). Coaching in the K-12 context. In S. J. Fletcher & C. A. Mullen (Eds.), *The Sage handbook of mentoring and coaching in education* (pp. 273-294). Los Angeles, CA: Sage.

LaPointe-McEwan, D., DeLuca, C., & Klinger, D. (2017). The role of the middle leader: Supporting evidence-use in networked educator professional learning. *Educational Research, 59*(2), 136–153.

LaPointe-McEwan, D., Heggie, L., & Klinger, D. (2018). *Literature review report.* MISA EAST Professional Network Centre, Eastern Ontario Staff Development Network, Ontario, CA.

Leat, D., Lofthouse, R., & Tower, C. (2012). Improving coaching by and for school teachers. In S. J. Fletcher & C. A. Mullen (Eds.), *The Sage handbook of mentoring and coaching in education* (pp.43-58). Los Angeles, CA: Sage.

Leithwood, K., Aitken, R., & Jantzi, D. (2006). *Making schools smarter: Leading with evidence*. Thousand Oaks, CA: Corwin Press.

Lieberman, A., & Miller, L. (2014). Teachers as professionals: Evolving definitions of staff development. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education* (pp. 3-21). New York, NY: Guilford Press.

Miles, M. B., and Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook.* (2nd ed.) Thousand Oaks: Calif.: Sage, 1994.

Moolenaar, N. M. (2012). A social network perspective on teacher collaboration in schools: Theory, methodology, and applications. *American Journal of Education, 119*(1), 7–39.

Muijs, D., West, M., & Ainscow, M. (2010). Why network? Theoretical perspectives on networking. *School Effectiveness and School Improvement, 21*, 5–26.

Namey, E., Guest, G., Thairu, L., & Johnson, L. (2008). Data reduction techniques for large qualitative data sets. In G. Guest & K. M. MacQueen (eds.), *Handbook for team-based qualitative research* (pp. 137-61). Lanham, MD: AltaMira Press.

Nelson, T. H., & Slavit, D. (2008). Supported teacher collaborative inquiry. *Teacher Education Quarterly, 35*, 99–116.

Opfer, V., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research, 81*, 376–407.

Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd ed).* Thousand Oaks, CA: Sage.

Patton, M. Q. (2012). *Essentials of utilization-focused evaluation*. Los Angeles, CA: Sage Publications.

Quatroche, D. J., Bauserman, K. L., & Nellis, L. (2014). Supporting professional growth through external resources. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education* (pp. 431-442). New York, NY: Guilford Press.

Robinson, M.A. (2010). *School perspectives on collaborative inquiry: Lessons learned from New York City, 2009–2010*. Philadelphia, PA: Consortium for Policy Research in Education.

Rogers, P. (January, 2011). Program theory and logic models for systemic evaluation. Paper presented at the International Conference on Systemic Approaches in Evaluation, Eschborn, Germany.

Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness and School Improvement, 27*(2), 228–254.

Timperley, H. (2011). Realizing the power of professional learning. New York, NY: McGraw-Hill.

Vangrieken, K., Meredith, C., Packer, T., & Kyndt, E. (2017). Teacher communities as a context for professional development: A systematic review. *Teaching and Teacher Education, 61*, 47-59. doi: 10.1016/j.tate.2016.10.001

Vineyard, L., 2010. *Collaborative inquiry: a strategy for assessing Response to Instruction and Intervention (RtI^2) for English learner students*. (Doctoral dissertation). Available from ProQuest Dissertations & Theses database. (UMI No. 3446801)

Wellman, B., & Lipton, L. (2004). *Data-driven dialogue: A facilitator's guide to collaborative inquiry*. Mira Via, LLC.

Youngs, P., & Lane, J. (2014). Involving teachers in their own professional development. In L. E. Martin, S. Kragler, D. J. Quatroche, & K. L. Bauserman (Eds.), *Handbook of professional development in education* (pp. 284-303). New York, NY: Guilford Press.

Appendix A: Summary of Year 1 Project Activities

EOSDN Regional Mathematics "Closing the Gap" Project
Year 1 (2013-2014)

Focus of the Project/Study

The EOSDN Math project/study is supporting teacher inquiry and professional learning in mathematics through the following:

- examining beliefs about teaching mathematics (mindset)
- developing fluency in the observation, description, and analysis of students at work and their work products (knowing what to look and listen for)
- developing fluency in posing questions, providing feedback and consolidating learning in ways that promote student thinking (shifting the role of the teacher from instructor to co-learner/coach)
- using the "power of co" through co-planning, co-observing/assessing students at work, and co-moderating student work
- networking within and beyond the DSB

All of this is being done through a regional focus on proportional reasoning and representation of student thinking in mathematics – each of which cuts across strands, topics, and courses.

Valued Components of the Project

Steering Committee Sessions

A key component of the EOSDN math project/study is the ongoing learning of math program facilitators from each DSB. This 'support of the supporters' is being recognized by participants and by the researchers as having significant impact on the depth and spread of the project. Operational items have been dealt with through teleconferences, emails, and end of session 20 minute updates. The focus of each session has been on learning.

September at HPEDSB This session focused on local Implementation plans, and the submission of DSB plans and letter of financial commitment. Dr. Rebecca Luce-Kapler from Queen's University led a discussion about Queen's University's role as researchers and support within the project. She also spoke about assessment and monitoring, and each DSB was given the opportunity to share questions and/or concerns regarding assessment and monitoring.

October at CDSBEO The focus was to gain further knowledge in the areas of Proportional Reasoning and EQAO (facilitated by Lorraine Giroux, School Support and Outreach Education Officer), and to continue discussions about monitoring (facilitated by Danielle LaPointe and Christopher Deluca, Queen's Researchers).

December at OCDSB Each DSB shared ideas from local implementation of the EOSDN Math Project. The remainder of the day was facilitated by Queen's Researchers, Danielle LaPointe and Don Klinger leading learning about Data/Evidence Collection and Analysis. Each DSB had the opportunity to work through a shared data analysis process using data from the EOSDN Regional Think Tank Sessions. DSB teams followed the data analysis process that was modelled to analyze data from their own DSB.

January at OCSB Steering Committee Reps planned for facilitation of learning at the SIM Session on January 31: EOSDN Math Project - Proportional Reasoning, the Process of Representation and Teacher Fluency. The remainder of the day was facilitated by Queen's Researcher, Danielle LaPointe, the topic being Observing with Purpose: Exploring Classroom Video Analysis.

March at OCDSB Cathy Bruce, Trent University Researcher facilitated the learning with the focus on being an effective instructional coach - facilitation, efficacy, and how mathematics leaders support others. She also focused on student representation of their thinking using fractions as the proportional reasoning content.

April at Limestone Planning Session for the May 14-15 Regional Think Tank Session with a focus on consolidating the learning of teacher participants in the project. As well, the Queen's Researchers explained how they will gather data from participants to develop a deeper understanding of the structures that support the success of collaborative professional learning initiatives (where success is defined as the impact of the professional learning program on enhanced teacher practice, improved student learning and achievement, and increased collaboration among educators).

May at ALCDSB Finalizing the planning for the consolidation day; providing input into the report to the Board of Directors; working with Queen's researchers on data collection tools.

June at RCDSB Steering Committee reps consolidated their DSB data into a summary report and created a poster representing the learning journey within the district. The poster becomes part of the report to the Ministry of Education.

Access to Expertise

Having access to acknowledged experts in mathematics and in research methodology is also valued highly by DSB participants.

- Marian Small facilitated three Regional Think Tank Sessions on September 27(Kingston), October 7(Ottawa) and 8(Kemptville). The 700 teachers participating in the Math Project were invited to attend one of the sessions. The focus for the learning was on developing and/or refining an understanding of Proportional Reasoning in the Ontario Curriculum K-12; 'Doing the Math' in DSB teams; Strategies for Providing for Feedback using Asset Model stance.

- Each DSB was funded for up to 5 days of in-district mathematics expert time. In some DSBs, the math expert worked directly with teacher inquiry teams; in other DSBs she/he worked with school administrators and district facilitators. Some DSBs collaborated co-terminously and added extra days with the math expert. DSBs were able to select the math expert with whom they worked, provided the focus was related to the project.

- Math facilitators from each district are working with researchers from Queen's University Faculty of Education to become more effective in formulating an inquiry and in assessing and monitoring progress in the implementation work. The researchers and project coordinator have been spending two days within each DSB to provide support tailored to the district inquiry focus - to advise on how to assess and to document evidence of the learning of students and how to gauge the impact of strategies as they are being incorporated into classroom practice.

- In April, an inquiry team from each DSB was invited to attend the MISA/Math day where researchers from Queen's and the Student Achievement Division provided support on data analysis.

- In May, many members of the Steering Committee attended the OAME conference, funded by the Math project, where they attended workshops and plenaries by leading math educators. Exposure to different experts will be useful as we move into year two.

Consolidation of Year 1 Learning

District School Board Learning

A consolidation day was held in mid-May with 100 teacher/school administrator participants. From the table dialogue and the artifacts presented, some encouraging themes emerged:

- "Kids can do it!" – Teachers reported that students could meet high expectations in math
- "Math makes sense" – Teachers reported that *big ideas* in math help connect the different topics, strands, courses they teach – "I used to teach math compartments, now I teach connections"
- "Abandon the pie chart" – Teachers reported that student thinking is revealed in representation – they can see, hear and probe their reasoning through a variety of ways
- "Spreading the Joy of Math" - There is spread beyond the original inquiry groups – There were several examples of all grades tackling the same open problem – creating a school math community
- "Fluency instead of speed" – Teachers reported that think time, persevering time is important for deep learning
- "We can do it" – There was energy and optimism in the room – "When we have the same focus we can support each other".

As part of the consolidation process, steering committee members spent a second day analyzing the data from their own DSB with support from the Queen's researchers.

Regional Learning

Nearing the end of year 1 of the EOSDN Regional Math Project/study, the Queen's research partners gathered data from teacher participants, school administrators, math facilitators on the Steering Committee, and project leads. The combination of surveys and interviews adds to the classroom data from each district that is being analysed and studied and is presented in the developmental evaluation report and project poster.

Data Collection Year 1 (2013-2014)

Phase 2 (Year 1) of the evaluation involved collecting data on the effectiveness of EMP activities to meet the EMP's initial aim as stipulated in the program theory. The evaluation used a collaborative, developmental methodology to guide data collection and analyses. Data were collected from multiple participants including: project leads, district facilitators, teachers, school administrators, and expert learning partners (i.e., math and research experts). Data were collected in Spring 2014, at the end of Year 1 of the EMP, to provide an interim sense of the project's impact on participants' learning and practices, and to identify the structures that supported the project's success. In addition, data were obtained during project activities (i.e., Steering Committee sessions, DSB school visits, and year-end sharing sessions) to determine immediate and sustained value of project activities on professional learning and practice.

Table 1: *Data Collection by Participant Group (Year 1)*

Participant Group	Data Collection Activity	Number	Type of Data
Project Leads	Steering Committee Sessions	10	– Observation – Artifacts
	Project Lead Interview	2	– Interview
District Facilitators	Steering Committee Sessions	10	– Observation – Artifacts
	DSB Visits	9	– Observation
	Facilitator Survey	22	– Fixed-response – Open-response
	Facilitator Interview	9	– Interview
	DSB Inquiry Poster	9	– Artifact
Teachers	School Visits	6	– Observation – Artifacts
	Teacher Survey	184	– Fixed-response – Open-response
	Consolidation Day (May 14)	9	– Artifacts
School Administrators	School Visits	6	– Observation – Artifacts
	Administrator Survey	12	– Fixed-response – Open-response
Experts	Interview Questionnaire	4	– Interview

Data were primarily collected through qualitative methods including in-depth interviews and ethnographic observations (Patton, 2002). In addition, surveys were administered to district facilitators, teachers, and administrators to gain additional quantitative evidence on the impact of the EMP. These multiple data collection methods were used in order to triangulate findings and to established trustworthy results. Data tools (i.e., interview protocols, questionnaires, and surveys) are presented in Appendices B and C. Table 1 provides a summary of the data collection activities for each participant group.

Along with the two project leads, the EMP involved educators representing nine DSBs in the Eastern Ontario region: 700 teachers and 350 school administrators, and approximately 50 district facilitators from the nine DSBs in Eastern Ontario. The 22 district facilitators who regularly attended Steering Committee sessions completed surveys. Teacher surveys were distributed to five of nine the districts; this convenience sample was selected based on DSBs in which permission for external research was obtained. From these five DSBs, we received 184 surveys; however 20 of those surveys were from teachers who were not officially involved in the EMP. The response rate within these DSBs was 61.4% (see Table 2).

Key Findings in Year 1: What matters most to participants' learning?

1. ***Readiness:*** *Recognizing and addressing educators' mindsets and previous learning experiences supports their engagement in collaborative professional learning.*

   Educators began the EMP with different degrees of comfort and experience with math pedagogy, inquiry, and data practices, which differentially impacted their learning journeys within the EMP. The project leads and experts acknowledged and were responsive to different degrees of readiness in promoting educators' knowledge acquisition and fluency of application of new learning in practice. In particular, our findings identified the importance of differentiated support in the professional development of district facilitators, and this would likely extend to teachers and school administrators as well.

2. ***Ownership:*** *Educators engaged in collaborative professional learning identify their own area of inquiry so the learning is meaningful and relevant to their role, context, and needs.*

   Project leads and district facilitators spoke about the "loose-tight" structure of the project that enabled educators, within the overall "enabling constraints" of project goals, to engage in inquiry meaningful to their respective contexts and needs. Although the EMP identified three key goals (i.e., building educator fluency in the areas of proportional reasoning and the process of representation in math), there was considerable latitude for all educators involved to determine an area of inquiry that was meaningful to them. This freedom appears to have increased educators' engagement in the EMP and broadened the range of inquiries occurring under the umbrella of the project.

3. ***Alignment:*** *Strategically aligning professional learning to a meaningful focus promotes a common language and depth and spread of learning among educators within a school district and across a region.*

   The purposeful alignment connecting the focus of the EMP with various, ongoing professional learning activities helped to create a project that was responsive to the needs of students, teachers, schools, districts, and the province. Such alignment also helped to ensure the EMP would be viewed as an integrated project within the larger school, district, and regional goals, rather than as a separate disconnected initiative.

4. ***Relationships:*** *Building trusting, supportive relationships among all participants involved promotes a culture in which educators can take risks in professional learning and practice.*

   Much of the success of the EMP was grounded in the professional relationships that developed throughout the first year of implementation. All of the participants reported the importance of trusting relationships as a support of collaborative professional learning and change in professional practice. As trusting relationships developed over the year, educators began to take more risks in their learning and practices. They also became more comfortable talking about challenges, barriers, and opportunities with colleagues and more willing to ask for support from experts and each other. As a result of these relationships, the regional learning and dialogue created a momentum that allowed educators to explore their thinking and learning more deeply around the goals of the EMP in their respective districts.

5. ***Intentionality:*** *Devoting time and personal resources to build fluency, support practice, monitor learning, and develop relationships contributes to meeting professional learning goals.*

Building professional fluency and changing professional practice occurs through intentional design and actions. It requires professional commitment supported with resources and opportunities to engage in learning, reflection, and dialogue. Educators in the EMP reported that having designated times to engage in learning, reflection, and dialogue with colleagues, supported by expert learning partners as appropriate, impacted their learning and practice. Educators also reported the need for flexible support in their own contexts as they explored and practiced implementing new learning in-between group sessions. There was general agreement that this support should be regular and ongoing, include feedback from colleagues and experts, and be individualized to the role and readiness of each educator.

Key Recommendations after Year 1

The following four recommendations were made to guide next steps for the EMP in Year 2 (2014-2015).

1. ***Cultivate depth and spread***

   Continue to focus on the EMP's goals, informed by emerging understandings about what matters most in building educators' fluency, to promote depth and spread of the learning. The direct involvement of fewer schools with more educators per school may support deeper implementation and precise monitoring of learning in schools and classrooms. An intentional focus on meeting the professional learning needs of secondary teachers and school administrators may increase the EMP's impact on these educators. All those involved in the EMP are encouraged to be cognizant of authentic opportunities to align the learning of this project with other district and school goals and professional learning initiatives to maximize the spread of learning.

2. ***Focus on assessment and monitoring***

   Continue to develop educators' assessment and monitoring strategies that are purposeful and responsive to learners' needs. Expert modelling and support of these practices is essential in all phases of learning and implementation and as new educators become involved in the EMP. Provide opportunities for facilitators to explore and practice these strategies in ways that minimize stress and concerns with trying "something new." This includes the extensive use of formative methods of assessment and developmental methods of monitoring. Further, work to develop common monitoring procedures and tools that not only meet quality requirements but also those of district facilitators and school educators.

3. ***Contribute to professional learning***

   Continue to find the balance that provides opportunities for professional judgment and ownership within a structure that allows the learning to be meaningful to participants and the broader educational community within the region and the goals of the EMP. Educators' learning must address individual goals as well as the goals of the project.

4. ***Rethink leadership***

   Explore important questions about leadership. Facilitators, school administrators, and teacher leaders all fulfill leadership roles. How do we develop and support leadership capacity among educators in each of these roles? How does building leadership capacity in facilitators, administrators, and teacher leaders contribute to spread of professional learning in schools and systems? Year 1 provided important opportunities to further develop the leadership skills of district facilitators. It will be important to continue to develop these skills while also helping teachers involved in the EMP to develop their own leadership skills related to the goals of the EMP and their inquiries. Such leadership models will further help to cultivate depth and spread.

Appendix B: Summary of Year 2 Project Activities

EOSDN Regional Mathematics "Closing the Gap" Project
Year 2 Activities (2014-2015)

During Year 2, the Steering Committee continued to use its monthly meetings for their own continued learning in the facilitation of adult learning of mathematics content and pedagogy and the systematic collection and analysis of evidence of adult and student learning. Over the first four meetings, DSB facilitators formally shared the DSB Year 1 Research Posters; the DSB Year 2 Inquiry Questions and/or Theories of Action; and the DSB Year 2 Data Collection Processes.

September: The group reviewed and reflected on the EOSDN Math Project Report from Year 1 to determine the Steering Committee research focus for learning in Year 2. As well, the proposal for the Secondary Mathematics Focus was explained which included the goal, structure and costs.

October: Christine Suurtamm facilitated learning and discussions around the area of Mathematics teaching and learning: dilemmas, challenges and solutions through the lens of her research in this area. This learning was intended to further develop Math facilitator knowledge in the area of Mathematics teaching and learning.

November: Queen's University researchers shared their process for data collection for the Year 2 Evaluation Report which will explore the tensions identified in the Collaborative Inquiry in Ontario monograph. They provided a review of purposeful data collection process, and in DSB teams the Steering Committee reps discussed and planned strategies for Year 2 data collection.

January: With a focus on Assessment, Lorraine Giroux, EQAO School Support and Outreach, facilitated learning about EQAO Math Assessments and Proportional Reasoning. EQOA data from Eastern Ontario 2013-14 results was shared. The Steering Committee reps reflected on Years 1 and 2 to develop a potential focus for learning in Year 3, if funds were made available by the Ministry.

February: Facilitated by Queen's Researchers, Danielle LaPointe and Don Klinger, the February Steering Committee meeting provided Steering Committee reps the opportunity to analyze data that had been collected thus far in Year 2 of the EOSDN Math Project within their DSB.

March: The learning, sharing and discussions focused on Pedagogical Documentation facilitated by Sharon McNamara-Trevison, Colleen DeMille, Danielle LaPointe and Tammy Billen. The group reviewed the Pedagogical Documentation Revisited monograph in the context of their own DSBs. Student Work Study Teachers: Nikki Roy, Erik Lemke, Alison MacDougall, and Katie Williamson shared their experiences with regards to Pedagogical Documentation. Susan Davidson, Helene Coulombe and Kim Lacelle from OCSB then shared their DSB Pedagogical Documentation Learning journey. EOSDN Secondary Math Project representatives shared their learning journey thus far.

April: The Steering Committee planned for the EOSDN Math Project Consolidation Day on April 28. After reviewing 2014 Consolidation Day agenda, Steering Committee reps reflected on components of the day that would be maintained and provided suggestions for changes to enable rich sharing from Year 2 of the project.

Consolidation of Year 2 Learning

District School Board Learning

A consolidation day was held in late-April with approximately 100 teacher/school administrator participants. From the table dialogue and the artifacts presented, some encouraging themes emerged:

- "Planning a math task is planning for consolidation."—Teachers were increasingly focused on highlighting *big ideas* in math lessons through consolidation during instruction.
- "What is this student work telling me?"—Teachers engaged in pedagogical documentation, observing and listening to their students' current understandings to enable responsive instruction.
- "How do we move from presentations to conversations?"—Teachers fostered accountable talk among students in their math classrooms.
- "We need to engage in productive floundering!"—Teachers and students explored multiple ways of thinking about and solving math problems.
- "All students have an entry point."—Rich, open problems allowed all students to engage in problem solving tasks.
- "Get your toolbox!"—Manipulatives supported students' learning across K-12 classrooms.

As part of the consolidation process, steering committee members spent a second day analyzing the data from their own DSB with support from the Queen's researchers.

Regional Learning

Nearing the end of year 2 of the EOSDN Regional Math Project/study, the Queen's research partners gathered data from teacher participants, school administrators, math facilitators on the Steering Committee, and project leads. The combination of surveys and interviews adds to the classroom data from each district that is being analyzed and studied and is presented in the developmental evaluation report and project poster.

Data Collection Year 2 (2014-2015)

Phase 3 (Year 2) of the evaluation involved collecting data on the effectiveness of EMP activities to meet the EMP's initial aim as stipulated in the program theory. The evaluation used a collaborative, developmental methodology to guide data collection and analyses. Data was collected from project leads, district facilitators, teachers, school administrators, student achievement officers (SAOs), and expert learning partners at regular intervals throughout Phase 3 of the evaluation. Data were primarily collected through qualitative methods including in-depth interviews, open-response questionnaires, and ethnographic observations (Patton, 2002). In addition, surveys were administered to district facilitators, teachers, and school administrators to gain additional quantitative evidence on the impact of the EMP. These multiple data collection methods were used in order to triangulate findings and to establish trustworthy results. Data tools (i.e., interview protocols, questionnaires, and surveys) are presented in Appendices C and D. Table 1 provides a summary of the data collection activities for each participant group. [Note: The job action initiated in May 2015 precluded affiliated educators from participating in subsequent data collection activities.]

Table 1: *Data Collection by Participant Group (Year 2)*

Participant Group	Data Collection Activity	Number	Type of Data
Project Leads	Steering Committee Sessions	8	– Observation/Artifacts
	Project Lead Questionnaire	2	– Open-response
	Project Lead Interview	2	– Interview
	Consolidation Day (April 29)	9	– Artifacts
District Facilitators	Steering Committee Sessions	8	– Observation/Artifacts
	DSB Visits	7	– Observation/Artifacts
	Facilitator Survey	12	– Fixed-response – Open-response
	Facilitator Questionnaire	9	– Open-response
	DSB Inquiry Poster	5	– Artifact
Teachers	School Visits	7	– Observation/Artifacts
	Teacher Survey	113	– Fixed-response – Open-response
	Teacher Questionnaire	21	– Open-response
	Teacher Focus Group	6 (n=29)	– Interview
	Consolidation Day (April 28)	9	– Artifacts
School Administrators	School Visits	7	– Observation/Artifacts
	Administrator Survey	23	– Fixed-response – Open-response
	Administrator Questionnaire	2	– Open-response
	Administrator Interview	6	– Interview
Experts	Expert Questionnaire	4	– Open-response

Along with the two project leads, the EMP involved educators representing nine DSBs in the Eastern Ontario region: 400 teachers from 220 schools, and approximately 45 district facilitators from the nine DSBs in Eastern Ontario. Twelve of 45 district facilitators who regularly attended Steering Committee sessions completed surveys (response rate of 26.7%). We received 113 teacher surveys (response rate of 28.3%), and 23 administrator surveys (response rate of 10.5%; see Table 2).

Key Findings in Year 2: What matters most to participants' learning?

1. ***Loose-Tight Structure:*** A focus on common project goals while supporting related, nested district, school, and classroom inquires responsive to local needs and priorities fosters educator engagement.

   In our Year 1 evaluation report, both project leads and district facilitators spoke about the "loose-tight" structure of the project that enabled educators, within the overall "enabling constraints" of the EMP, to engage in inquiry meaningful to their respective contexts and needs. Despite this latitude, Year 1 specific inquiries were closely related to the regional EMP goals. In Year 2, the value of the "loose tight" structure became increasingly apparent in three primary ways. First, at the start of Year 2, district facilitators, along with research experts, project leads, and SAOs, co-developed four precise regional guiding questions. These questions were grounded in the Year 1 EMP evaluation findings, and were nested within, but distinct from, the three overarching project goals. Second, district facilitators pursued selected regional guiding questions in their districts and developed related DSB inquiry foci that were precise and relevant to the needs of educators in their district's schools and classrooms (Table 2). Third, district facilitators provided opportunities for educators in schools and classrooms to pursue meaningful areas of inquiry nested within their identified DSB inquiries. These nested regional inquires across regional contexts (see Figure 1) supported the dual professional learning purposes of: (a) attaining systemic instructive professional learning goals (i.e., developing new knowledge and instructional practices in math grounded in theory and aligned with curriculum); and (b) fostering active engagement of educators in personal professional learning goals relevant and meaningful in their current contexts of practice. Further, the sharing of these connected but distinct inquiries enabled those across the region to learn from the experiences of others.

2. ***Sustained Focus:*** A continued regional focus on project goals and research-based strategies cultivates depth and spread.

   The EMP's sustained focus on the three overarching goals in Year 2 supported depth of professional learning and the development of a common knowledge and understanding of math teaching and learning through the big idea of proportional reasoning among participants. Among other benefits, the result has been an emerging common math language across the region—facilitating rich professional dialogue among educators and contributing to shifts in district, school, and classroom math culture. Moreover, the EMP provided recurring opportunities for educators to engage in reflective, collaborative professional learning and dialogue within and across regional contexts. Professional learning and dialogue was most commonly supported by district facilitators, however in some cases, school-based educators involved in the project for the second year took on informal leadership roles, fostering the spread of learning to educator colleagues within and outside the EMP. It was apparent throughout the EMP, that changes in the "math culture" within participating schools and teachers' instructional practices require time, resources and sustained effort.

3. ***Increased Precision:*** As educator fluency and understanding of systematic inquiry develops, the focus of learning and implementation becomes increasingly precise.

   Building on the collective learning experiences and emerging fluency during Year 1, EMP participants pursued more precise professional learning goals in Year 2, with an increased focus on implementation of professional learning in the context of practice. Specifically, educators focused their learning on more precise content areas (e.g., understanding fractions through the linear model, developing multiplicative thinking in primary grades), linked to more explicit pedagogical practices (e.g., questioning, diagnostic assessment, pedagogical documentation, consolidation, use of manipulatives), and supported by triangulation of purposefully collected evidence (products, conversations, and observations) to demonstrate educator and student learning within and across contexts.

4. ***Supported Implementation:*** The provision of responsive, context-embedded support for educators promotes transfer of learning into practice**.**

   Grounded in Year 1 collaborative evaluation findings and acknowledging the importance of opportunities to apply professional learning in the context of practice, the EMP prioritized organizational support for increased context-embedded support throughout Year 2. This support was differentiated and responsive to local educators' needs and manifested in two primary ways. First, the EMP provided regular opportunities for knowledgeable others (district facilitators, math and research experts) to support the implementation of new math pedagogy and inquiry processes. These knowledgeable others enriched educators' learning and supported educators' risk taking within their own professional practice. Second, educators worked with colleagues, who had shared interests, to explore professional learning goals and support each other's implementation of learning and resulting pedagogy within their own practice. Educators valued these critical opportunities to work with such colleagues as they collectively developed fluency with math pedagogy and inquiry processes.

5. ***Collaborative Leadership:*** Processes that enable educators to work together within and across regional contexts provide valuable supports that enhance the development and attainment of: (1) professional learning goals; (2) shifts in learning culture; and (3) educational leadership.

   Rooted in professional relationships that developed during Year 1, collaborative leadership among educators emerged within and across contexts in Year 2. This collaborative leadership was central to the success of the EMP and evident in multiple ways including: (1) the project leads and research experts facilitating regional learning at Steering Committee sessions; (2) district facilitators working collaboratively to support regional, district, and school learning; (3) district facilitators, school administrators, and teachers collectively leading learning in schools; and (4) teacher teams in schools supporting the learning of administrators, peers, and students. We recognized the value of collaborative leadership among educators to foster the spread of EMP learning across the region and shifting the regional math culture, specifically cultivating growth and inquiry mindsets among educators and students. Furthermore, collaborative leadership contributed to meaningful learning within and across regional contexts that provided educators with opportunities to move beyond sharing professional ideas and experiences to collaboratively generating new professional knowledge.

Key Recommendations after Year 2

The following four recommendations were identified to guide next steps for the EMP in Year 3 (2015-2016).

1. ***Promote spread and sustainability***

   Continue to focus on regional project goals and "loose-tight" nested inquiry structure, but adopt common professional learning models (e.g., Lesson Study) and focus on key practices (e.g., pedagogical documentation) that have the potential to support regional math learning and instructional practice throughout Year 3 and beyond. Common models and key practices should be collaboratively determined by Steering Committee members at the outset of Year 3.

2. ***Cultivate further collaborative leadership.***

   Leverage district facilitators and math experts, in conjunction with common professional learning models and foci, to develop school-based collaborative leadership teams among teachers and school administrators. These teams may play a central role in adapting, sustaining, and spreading new math pedagogical practices and shifting math culture in schools and classrooms across the region in Year 3 and beyond the EMP's funding.

3. ***Focus precise support on assessment and monitoring.***

   Provide differentiated, responsive support for educators in all regional contexts to further develop educators' fluency with assessment and monitoring. Ensure that these strategies are purposeful and responsive to learners' needs and leverage expert modelling and support of learning and implementation as appropriate in districts, schools, and classrooms. Further, work to develop common monitoring procedures and tools that not only meet quality requirements but also those of district facilitators and school educators.

4. ***Identify models and methods to examine the impact of inquiry efforts to impact students' learning.***

   Along with a focus on assessment and monitoring for the purposes of teaching and learning in the classroom context, it will also be critical to expand these assessment and monitoring efforts to provide links between professional inquiry efforts and subsequent student learning. As one example, educators involved in the project may now have the skills to develop a "theory in action" for their specific inquiries. These theories in action can enable those in involved in systematic inquiry to more explicitly identify the intended impacts of their efforts on students' educational outcomes.

Appendix C: Summary of Year 3 Project Activities

EOSDN Regional Mathematics "Closing the Gap" Project
Year 3 Activities (2015-2016)

Project activities for Year 3 of the EOSDN Math Project followed a similar structure as Year 1 and 2, in that regional Math leads attended monthly Steering Committee meetings. The learning at these sessions shifted from facilitation of educator learning of mathematics content and pedagogy to developing 'collaborative leadership' within district school boards to promote sustainability and spread. As in the first two years of the project, Queen's Researchers continued to support and/or refine the systematic collection and analysis of evidence of educator and student learning. All Steering Committee meetings were co-planned and co-facilitated by Tammy Billen (Project Coordinator) and Danielle LaPointe-McEwan (Queen's researcher).

September: Steering Committee reps reviewed and reflected on the EOSDN Math Project Developmental Report from Year Two, with a focus on the Key Findings and Recommendations for the purpose of DSBs developing their EOSDN Math plans for year three. DSB teams were also completed a Needs Assessment Survey for the purpose of determining next steps for Steering Committee meeting learning.

October: The objective of this meeting was to give regional Math reps the opportunity to think, discuss and reflect on personal and DSBs ideas of 'Developing Collaborative Leadership'. Discussions were facilitated through questions pertaining to educator leadership; learning structures; mathematical fluency; and data collection and analysis. The Ontario Leadership Framework was used as a framework for reflecting and planning forward.

Shelley Yearley, Provincial Math Lead, shared experiences with modified Lesson Study and ideas for implementing this learning structure in the EOSDN project. The intent of this sharing was to give reps the opportunity to think about a learning structure that would meet the needs of the learners involved in the EOSDN Math Project.

November: Reviewing and reflecting on the EOSDN Math Project Regional learning from Year 2, reps determined regional and DSB guiding questions for Year 3. Reps planned and/or reflected on their year 3 DSB plan, revisiting the Key Recommendations from the Year 2 report to ensure plans aligned with these recommendations. The Steering Committee collectively worked through a process of determining the guiding questions for learning regionally that would be addressed at subsequent monthly Steering Committee meetings. Don Klinger and Danielle LaPointe-McEwan, Queen's Researchers supported team in developing DSB inquiries and guiding questions.

January: The learning focused on mathematics content for teaching, and instructional strategies to meet teacher and student need. Sharon McNamara-Trevisan and Ruth McNulty (Student Achievement Officers) shared an overview of the big ideas from the MISA "Celebration of Thinking through Collaboration" with Peter Liljedahl. Shelley Yearley (Provincial Math Lead) and Ross Isenegger (Provincial Math Lead, Digital Resources) facilitated learning in the area of fractions referencing resources (e.g. Fractions Learning Pathways and Math digital resources) to support educator learning. DSB teams were provided time to reflect and plan next steps when considering the learning from the day and the EOSDN Math project regional inquiry and guiding questions.

March 30 and 31:
March 30: Reps reflected on their EOSDN Math plans and learning from the 2015-16 year. DSBs shared a three-minute 'Public Service Announcement' that captured their DSB Inquiry Question(s), Celebrations and Tensions. The professional learning cycle was used as the framework by which DSBs reflected, shared and planned forward.
March 31: This regional networking session included representation from the MISA and EOSDN Math groups. Rachel Ryerson (Ministry of Education) facilitated the learning of 'Ethical Use of Pedagogical Documentation'.

April: The Steering Committee planned for the EOSDN Math Project Consolidation Day scheduled for May 10, 2016. After reviewing 2015 Consolidation Day agenda, Steering Committee reps reflected on components of the day that would be maintained, provided suggestions for changes to enable rich sharing from Year 3 of the project, and in teams planned the consolidation day. The teams were cognizant of framing the day in a manner that would encourage discussions about 'collaborative leadership' within their DSB.

May: Meeting the day following the Regional Consolidation, reps shared the reflections from the teachers and administrators who participated in the EOSDN Math this year. Reps began analyzing DSB data using Year 3 guiding questions as a framework.

In May, some Steering Committee members also presented their learning from the project at the OAME and/or CAfLN Conferences and attended relevant workshops conducted by math and assessment experts in the field.

June: Steering Committee reps consolidated their DSB data into a summary report and created a poster representing the learning journey within their district. The poster becomes part of the report to the Ministry of Education.

Consolidation of Year 3 Learning

District School Board Learning

A consolidation day was held in May with 100 teacher/school administrator participants. From the table dialogue and the artifacts presented, some encouraging themes emerged:

- "Don't over-structure the learning."—Many school teams focused on cultivating students' understanding through spiraling of *big ideas* in the math curriculum.
- "What does evidence of success look like?"—District- and school-based educators collected multiple sources of classroom evidence to demonstrate impacts on students' learning.
- "Teachers need to collectively own the learning."—School-based inquiry teams identified and explored local needs and goals within the project.
- "Assessment build relationships."— Students valued personalized, targeted oral feedback from teachers.
- "Spread is happening."—District facilitators and school-based inquiry teams shared new learning and strategies with colleagues not officially involved in the project.

As part of the consolidation process, steering committee members spent a second day analyzing the data from their own DSB with support from the Queen's researchers.

Regional Learning

Nearing the end of Year 3 of the EOSDN Regional Math Project/study, the Queen's research partners gathered data from teacher participants, school administrators, district math facilitators on the Steering Committee, and project leads. The combination of surveys and interviews adds to the classroom data from each district that is being analyzed and studied and is presented in the developmental evaluation report and project poster.

Data Collection Year 3 (2015-2016)

Phase 4 (Year 3) of the evaluation involved collecting data on the effectiveness of EMP activities to meet the EMP's initial aim as stipulated in the program theory. The evaluation used a collaborative, developmental methodology to guide data collection and analyses. Data was collected from project leads, district facilitators, teachers, school administrators, student achievement officers (SAOs), and expert learning partners at regular intervals throughout Phase 4 of the evaluation. Data were primarily collected through qualitative methods including in-depth interviews, open-response questionnaires, and ethnographic observations (Patton, 2002). In addition, surveys were administered to district facilitators, teachers, and school administrators to gain additional quantitative evidence on the impact of the EMP. These multiple data collection methods were used in order to triangulate findings and to establish trustworthy results. Table 1 provides a summary of the data collection activities for each participant group.

Table 1: *Data Collection by Participant Group (Year 3)*

Participant Group	Data Collection Activity	Number	Type of Data
Project Leads	Steering Committee Sessions	10	– Observation – Artifacts
	Project Lead Interview	2	– Interview
District Facilitators	Steering Committee Sessions	10	– Observation – Artifacts
	DSB Visits	9	– Observation
	Facilitator Survey	22	– Fixed-response – Open-response
	Facilitator Interview	9	– Interview
	DSB Inquiry Poster	9	– Artifact
Teachers	School Visits	6	– Observation – Artifacts
	Teacher Survey	184	– Fixed-response – Open-response
	Consolidation Day (May 14)	9	– Artifacts
School Administrators	School Visits	6	– Observation – Artifacts
	Administrator Survey	12	– Fixed-response – Open-response
Experts	Interview Questionnaire	4	– Interview

Along with the two project leads, the EMP involved educators representing nine DSBs in the Eastern Ontario region: 700 teachers and 350 school administrators, and approximately 50 district facilitators from the nine DSBs in Eastern Ontario. The 22 district facilitators who regularly attended Steering Committee sessions completed surveys. Teacher surveys were distributed to five of nine the districts; this convenience sample was selected based on DSBs in which permission for external research was obtained. From these five DSBs, we received 184 surveys; however 20 of those surveys were from teachers who were not officially involved in the EMP. The response rate within these DSBs was 61.4% (see Table 2).

Key Findings in Year 3: What matters most to participants' learning?

1. ***Educator Fluency:*** Educators leverage previous learning and experiences within the project, exercising sound professional judgment, based on knowledge of math content and processes as well as evidence-use.

   Educators' fluency continued to develop in Years 1 and 2 of the EMP, providing a foundation for multifaceted inquiries and professional learning goals in Year 3. Specifically, district facilitators leveraged previously developed capacity in inquiry processes and evidence-use to more independently identify meaningful areas of inquiry, prioritize and plan for purposeful data collection, and analyze and use evidence to inform math teaching and learning in their DSBs. These processes continued to be supported by research experts in Year 3, however this support became more precise and responsive to the current fluency and goals of district facilitators. In addition, school-based educator teams (i.e., classroom teachers, student support teachers, and school administrators) involved in the project for multiple years pursued precise professional learning and practice goals, rooted in previous learning and related to specific instructional practices and approaches to classroom assessment. These teams leveraged their developing fluency to determine how more knowledgeable-others (i.e., district facilitators, learning partners, and math experts) and research-based resources would be used to support their collective learning.

2. ***Embedded Learning:*** As educators develop fluency, they prioritize personalized learning opportunities, embedded within their respective contexts of practice and rooted in local educator and student needs.

   While regional learning sessions were necessary in EMP Years 1 and 2 to build educators' foundational knowledge specific to the project's goals, these sessions were less important for educators in Year 3. In particular, educators involved in the project for multiple years preferred opportunities to more deeply explore their beliefs and practices, and implement new strategies within their respective contexts of practice. For example, embedded learning opportunities allowed DSB-based teams (i.e., district facilitators) to plan for purposeful inquiry and data collection, adapt professional learning models, and determine math content foci in alignment with their BIPSAs. Likewise, embedded learning opportunities allowed school-based educator teams to collectively explore classroom implementation and analyze evidence of math teaching and learning from students in their own schools.

3. ***Evidence-informed Practice:*** Collecting, analyzing, and using multiple sources of data over time enhances and demonstrates the project's impacts on math teaching and learning in the region, DSBs, schools, and classrooms.

   Educators in DSBs, schools, and classrooms focused their efforts in Year 3 on evidence-informed practice, supported by the language and processes of AfL In particular, district facilitators engaged in systemic AfL—they developed DSB inquires and associated professional learning goals; developed success criteria for professional learning outcomes; identified potential data sources that could provide evidence of professional learning outcomes—including products, observations, and conversations; collected these data from

multiple stakeholders over time; and analyzed sources to inform subsequent learning and practice. School-based educators engaged in similar processes, prioritizing classroom data obtained through pedagogical documentation and diagnostic assessments to inform local professional learning and practice. In these ways, educators leveraged evidence to inform and demonstrate impacts of the project within and across regional contexts.

4. ***Collaborative Leadership:*** Educator fluency, coupled with embedded learning opportunities and trusting professional relationships, contributes to collaborative leadership among educators in the region, DSBs, and schools.

Educators involved in the project for multiple years emerged as collaborative leadership teams in Year 3. District facilitators contributed knowledge constructed within the EMP (e.g., math pedagogy, facilitation, inquiry processes) to educators involved in concurrent provincial and DSB-based initiatives. Furthermore, these district facilitators shared important insights from their EMP experiences during provincial and DSB planning sessions regarding the Renewed Math Strategy to be enacted in Year 4. School-based educators involved in the project for multiple years shared excitement about their EMP learning with colleagues not officially involved in the project, modelling new instructional strategies and assessment approaches and distributing research-based resources to spread learning within their schools.

5. ***Collective Ownership:*** As educators' fluency and collaborative leadership emerge, collective ownership of shared professional learning goals, reflective of local educator and student needs, is increasingly important.

In Year 3, professional learning goals were less focused on individual needs and interests and more focused on collective needs and interests. District facilitators across the nine DSBs readily developed and agreed upon regional guiding questions for Year 3, based on evidence of educator and student learning from Year 2 regional and DSB inquires. Moreover, Year 3 guiding questions were more interrelated than those developed in Year 2, reflecting cohesive regional learning priorities. Similarly, school-based educator teams pursued professional learning goals that targeted educator and student needs across classrooms within their schools. In previous years, individual educators generally set goals specific to their practice in their own classrooms. However, in Year 3 teams of school-based educators who had been involved in the EMP for multiple years moved toward setting common goals for students across their collective classrooms and, in some cases, across the entire school. This accelerated the learning and engagement of those teachers newly entering the project. Accordingly, regional, DSB, and school-based educators began to take collective ownership of educator and student learning within and across regional contexts—moving away from thinking about 'my students' and 'your students', toward thinking about 'our students'.

Key Recommendations after Year 3

The following four recommendations were identified to guide next steps for the EMP in Year 4 (2016-2017).

1. ***Sustain the "loose-tight" focus.***

   Continue to focus on the overarching project goals but allow DSB- and school-based teams to adapt various professional learning models (e.g., collaborative inquiry, lesson study) and explore meaningful areas of inquiry that target local educator and student needs in math. This is particularly important for educators who have been involved in the project for multiple years—these educators require latitude to explore precise areas of inquiry in more depth than educators who are new to the project. Such initiatives should be supported by relevant experts internal or external to the school district and the region.

2. ***Cultivate and refine approaches to collaborative leadership through regional learning sessions.***

   Devote regional learning time (i.e., selected Steering Committee sessions) to cultivating and refining approaches to collaborative leadership among DSB teams of school-based educators. Moreover, recognize that these school-based educators will likely require explicit opportunities to build foundational knowledge in math teaching and learning, facilitation, and evidence-use, thus enhancing their capacity to foster and spread changes in practice and culture among colleagues within their schools.

3. ***Prioritize personalized, embedded learning opportunities for educators, supported by more knowledgeable-others and/or research-based resources.***

   Provide educators with personalized learning opportunities embedded within their respective contexts of practice in order to attain desired EMP impacts. While central sessions are valuable for foundational knowledge building and networking, embedded learning supported by more knowledgeable-others enables professional learning and dialogue that is meaningful and relevant to local educators' and students' needs. In addition, develop internal capacity among district- and school-based educators in order to sustain this embedded learning beyond the project's funding.

4. ***Collect evidence of impact on students' learning in alignment with the Renewed Math Strategy in order to inform provincial math goals.***

   Continue to collect, analyze, and use evidence of the project's impact on students' math learning through various methods (e.g., pedagogical documentation, diagnostic assessment, formative assessments, large-scale assessments). However, as appropriate, align these efforts with the Renewed Math Strategy in order to explicitly inform provincial needs and goals for students in math. Continue to prioritize building district- and school-based educators' capacity to leverage quantitative and qualitative evidence to inform and monitor instructional practices and student learning outcomes.

Appendix D: Summary of Year 4 Project Activities

EOSDN Regional Mathematics "Closing the Gap" Project
Year 4 Activities (2016-2017)

Project activities for Year 4 of the EOSDN Math Project followed a revised structure that enabled collaborative leadership within and across regional, district, and school contexts. As in the first three years of the project, Queen's Researchers continued to support and/or refine the systematic collection and analysis of evidence of educator and student learning. All Steering Committee meetings were co-planned and co-facilitated by Eleanor Newman (Project Director), Tammy Billen (Project Coordinator), and Danielle LaPointe-McEwan (Queen's researcher) and attended by Ministry of Education personnel (i.e., Senior Education Specialist, Regional Student Success Lead, and Student Achievement Officers).

Month	**Steering Committee Participants**
September	district facilitators (math and special education leads)
October	district facilitators (math and special education leads), EMP school administrators
November	district facilitators (math and special education leads), EMP school teams (school administrators, support teachers, classroom teachers)
December	district facilitators (math, special education, and TELT leads)
January	district facilitators (math, special education, and TELT leads), EMP school administrators
February	district facilitators (math, special education, and TELT leads), EMP school teams (school administrators, support teachers, classroom teachers)
March	district facilitators (math and special education leads)
April	district facilitators (math and special education leads)
May	Day 1: district facilitators (math, special education, and TELT leads), EMP school teams (school administrators, support teachers, classroom teachers) Day 2: district facilitators (math, special education, and TELT leads), school administrators
June	district facilitators (math and special education leads)

Note. TELT = Technology Enabled Learning and Teaching.

July: - Regional superintendents and district math facilitators from the nine DSBs attended a special EOSDN Learning Session with a focus on the Renewed Mathematics Learning Strategy (RMS). EOSDN Math Project leads shared an overview of the RMS, and specifically the advice and direction pertaining to Teaching and Learning, Goals for Students, Classroom Pedagogy, Special Education and Curriculum. The EOSDN Math Project leads also summarized the 'Five Key Areas for Professional Thinking' from the EOSDN project and described how these areas support and align with the RMS.

September: District facilitators (math and special education leads) reviewed the Ontario Ministry of Education Renewed Math Strategy, and how the learning gleaned from the EOSDN Math Project would support RMS work in DSBs. The group also reviewed the whole-school approach of the 2016-17 EOSDN Math Project, which brings the project into tighter alignment with the RMS.

Danielle LaPointe-McEwan (Queen's Researcher) summarized the findings and recommendations from the Year 3 developmental evaluation report. The group considered the perspectives of policy, practice and research for the purpose of refining and/or developing new regional guiding questions for the current year.

October: School administrators engaged in the regional project joined the district facilitators for this learning session. Tammy Billen and Danielle LaPointe-McEwan shared an overview of the EOSDN Math Project regional inquiry questions and guiding questions for 2016-17. Participants reviewed the Ontario Ministry of Education Renewed Math Strategy, and its alignment with the EOSDN Math Project, as well as an overview of the structure and goals of the 2016-17 EOSDN Math Project. DSB teams reviewed the template for "Designing Effective Professional Collaborative Inquiry for Student Learning" and how this model aligns with learning within their DSB and school contexts. Administrators shared school strengths, needs and plans for addressing Mathematics within each of their schools with their DSB team. The group determined that the learner profiles of *students of mystery* would form a basis for planning and collaboration at each school.

November: School administrators and teachers involved in the regional Math Project joined with the district facilitators (math and special education leads). The group reviewed the overview of the EOSDN Math Project regional inquiry question and guiding questions for 2016-17 to provide a context for those who had not participated in the EOSDN Math Project to date. Danielle LaPointe-McEwan then shared the 'Revised Nested Regional Inquiry Model', explaining how this model aligns with the EOSDN Math Project and with the RMS. When considering the RMS renewed emphasis on Balanced Mathematics, DSB teams reflected on their current thinking about practices related to 'Balanced Mathematics' and created a mind map. Using a SWST-like stance, participants focused on school-identified *students of mystery* and used the 'Designing Effective Professional CI for Student Learning' framework for DSB teams (district facilitators, school administrators, support teachers, and classroom teachers) to develop DSB plans. Colleen DeMille and Tammy Billen sharing a possible process of utilizing Connie Quadrini and YCDSB's resource, *Supporting Students with Learning Disabilities in Mathematics* to address student needs.

December: Technology Enabled Learning and Teaching (TELT) leads from each DSB joined the district facilitators (math and special education leads). The focus for learning was 'Enhancing Precision in our Work' when considering the goals of the EOSDN Math Project, RMS, and DSB goals. Teams reviewed their EOSDN Math Project data collection plans, with a focus on the *students of mystery* and a whole school approach to meeting student needs. TELT leads contributed to DSB discussions as to how they could collaboratively support DSBs with a focus on the context of the EOSDN Math Project. Tracy Joyce and Heidi Ferguson (math facilitators, RCCDSB) shared a process for utilizing the YCDSB's *Supporting Students with Learning Disabilities in Mathematics* document to support teacher and student learning. DSBs discussed how this document could support teachers involved in the EOSDN Math Project to address student needs with focused intention and precision.

January: District facilitators (math and special education leads), school administrators, and Technology Enabled Learning and Teaching (TELT) leads were present. The objective for this meeting was to provide the opportunity to learn from each other about the use of assessment strategies, learner profiles, and pedagogical approaches in DSBs. District facilitators and school

administrators reflected on their current processes and strategies, planning forward to meet the needs of both educators and students involved in the EOSDN Math Project. Participants shared artifacts, processes and strategies in a gallery walk. School administrators shared specific school needs with TELT contacts in the area of Mathematics, the LD learner, and technology. Collectively, regional needs were identified. District facilitators shared processes for utilizing math resources provided by EOSDN with the purpose of supporting educator learning as a district and within schools.

February - School administrators and teachers (classroom and support) involved in the regional Math Project joined with the district facilitators (math, student support, and TELT leads). The group revisited the 'Revised Nested Regional Inquiry Model' – starting with the 'student' - explaining how this model aligns with the EOSDN Math Project and the RMS goals. DSB teams further refined their thinking about learner profiles using the *Learning for All* document for the purpose of developing profiles for each of their identified *students of mystery*. RCCDSB Steering Committee reps shared their process for meeting the LD learner needs utilizing Connie Quadrini and YCDSB's resource, *Supporting Students with Learning Disabilities in Mathematics*. The afternoon was facilitated by regional TELT leads, addressing technology needs identified at the January meeting.

March: District facilitators (math and special education leads) participated in the Ministry of Education's Virtual Learning Session facilitated by Connie Quadrini in the morning, with a focus the LD learner in Mathematics. In the afternoon, district facilitator shared processes for data collection with regards to DSB and EOSDN goals, and monitoring and documentation processes used for *students of mystery*.

April: The agenda for the day was to plan for the EOSDN Math Project Consolidation Day in May. After reviewing 2016 Consolidation Day agenda, district facilitators (math and special education leads) reflected on components of the day that would be maintained and provided suggestions for changes to enable rich sharing from Year 4 of the project. District facilitators then divided into three teams, to plan the Minds On, Regional Sharing Time, and Professional Learning for the day. Administrators involved in the project were invited to participate in a teleconference during this planning day for the purpose of district facilitators sharing plans and seeking feedback concerning the Consolidation Day.

May: Meeting the day following the Regional Consolidation, district facilitators analyzed DSB data using exit card responses from the Regional Consolidation day. District facilitators then shared the reflections from their teachers and administrators who participated in the EOSDN Math this year.

June: District facilitators (math and special education leads) further analyzed the exit cards from the Regional Consolidation day from a regional perspective using the 2016-17 guiding questions as a framework for analysis. Facilitators then consolidated their DSB data and created a poster representing the learning journey within their district. The DSB posters are included in the Appendix of this evaluation report to the Ministry of Education.

Consolidation of Year 4 Learning

District School Board Learning

A consolidation day was held in May with 137 participants. These participants included district facilitators (math, student support, and TELT leads), school administrators, teachers (classroom and support), and Student Achievement Officers. From the professional dialogue and the artifacts constructed by DSB teams, some encouraging themes emerged:

- "What can they do? How can I build on that?"—Developing asset-based learner profiles for *students of mystery* enhances precision in professional learning and practice.
- "Necessary for some, good for all…"—Focusing on supporting *students of mystery* helps educators support the learning of all students.
- "Assessment practices are changing."—School teams are relying less on products and assessing more through observations and conversations.
- "A whole-school approach is emerging."—School administrators and support teachers are supporting in-between work with classroom teachers.
- "Spread is happening."—District facilitators (math, student support, and TELT leads) are collaborating and spreading EMP learning within DSBs.

As part of the consolidation process, steering committee members spent a second day analyzing the data from their own DSB with support from the Queen's researchers.

Regional Learning

Toward the end of Year 4 of the EOSDN Regional Math Project/study, the Queen's research partners gathered data from teacher participants, school administrators, district facilitators on the Steering Committee, and project leads. The combination of surveys and interviews adds to the classroom data from each district that is being analyzed and studied and is presented in the developmental evaluation report and project poster.

Key Findings in Year 4: What matters most to participants' learning?

1. ***Purposeful Alignment:*** The purposeful alignment of regional project goals with provincial, DSB, and school priorities supports educators' ownership and engagement in networked regional professional learning.

   Over the past four years, the regional project inquiry and professional learning foci have been rooted in the province's commitment to enhancing math teaching and learning. However, in Year 4, the EMP's alignment with provincial priorities became more explicit with the introduction of the Renewed Math Strategy (RMS). In accordance with the provincial RMS document, the EMP maintained its ongoing focus on developing students' conceptual understanding of *big ideas* in math, implementing a balanced approach to instruction (i.e., building skills and understanding), cultivating growth mindsets in math among educators and students, monitoring evidence of impact on students (e.g., assessment *for* learning cycles and pedagogical documentation), and fostering collaborative leadership in schools among educators. In addition to these foci, the EMP adopted the RMS focus on students struggling in math (i.e., *students of mystery*), especially students with identified learning disabilities, through a whole-school approach that leveraged asset-based learner profiles, responsive instruction, targeted accommodations, and assistive technology. These RMS priorities were also reflected in the BIPSAs and SIPSAs of educators involved in Year 4, allowing these educators to engage in the regional project while concurrently addressing their DSB- and school-specific goals.

2. ***Precise Focus:*** Articulating a precise regional focus on supporting *students of mystery* enables targeted professional learning and responsive implementation among educators within classrooms, schools, and across regional contexts.

   In previous EMP years, educators focused their support on math learning for all students in a division or grade by addressing their own learning needs as educators. In Year 4, the RMS contributed a slightly revised focus. While maintaining the goal to support all students, a precise regional focus on understanding and supporting *students of mystery* in math was initiated, rooted in more explicitly considering individual student's needs. Consequently, all educators involved in Year 4 of the project co-developed asset-based learner profiles and monitoring plans for two *students of mystery* in each EMP classroom. These learner profiles and monitoring plans enabled targeted professional learning and responsive implementation at both regional and school-based sessions. Moreover, the focus on *students of mystery* and learner profiles promoted a common language which helped both educators and students name and notice math thinking and strategies. At the regional Consolidation Day in May, artifacts constructed by participating educators clearly illustrated student voice and highlighted the impacts on students' learning to a greater extent than in previous EMP years. Overall, the precise regional focus on supporting *students of mystery* throughout Year 4 elucidated the importance of leveraging students' learning needs to drive professional learning.

3. ***Whole-School Approach:*** Engaging school administrators, support teachers, and classroom teachers in regional and school-based professional learning sessions cultivates a whole-school approach and promotes spread throughout schools.

   Previous EMP years prioritized cultivating collaborative leadership in schools; however, Year 4 marked an important shift toward achieving this goal through changes to the structure of regional Steering Committee meetings. By including school administrators, support teachers, and classroom teachers at designated regional meetings throughout Year 4, school teams had critical opportunities to learn and plan with their district facilitators (math, student support, and TELT leads). In-between regional meetings, with support from district math facilitators where possible, enabled school teams to implement new practices and shared regional learning with their colleagues—most notably school administrators through staff meetings and support teachers through their ongoing work across classrooms. This contributed to a whole-school approach to supporting *students of mystery* through asset-based learner profiles and responsive instruction.

4. ***Conceptual Assessment:*** Monitoring the conceptual understanding of *students of mystery* through multiple forms of assessment (observations, conversation, and products) over time supports learning and informs instruction for all students.

   Stemming from the Year 4 focus on supporting *students of mystery* in math, educators began to assess these students' understandings of math concepts across continua of learning, as well as in relation to their achievement of grade-specific curriculum expectations. This helped educators better understand the needs of their *students of mystery* from a developmental perspective and provide instructional accommodations to enable these students' success in math. Moreover, educators recognized the importance of leveraging multiple forms of assessment (observations, conversations, and products) to understand and support their *students of mystery*—relying more on student voice in assessment (e.g., interviews, videos, observational notes) and less on paper-pencil products to guide instructional next steps. As the school year progressed, educators acknowledged that this approach to assessment supported learning and instruction with not only *students of mystery*, but all students.

5. ***School-based Support:*** Formal time for facilitated, school-based support of planning, implementation, and reflection helps administrators, support teachers, and classroom teachers apply new learning in their own contexts of practice.

   Year 4 prioritized the cultivation of a whole-school approach by including school administrators, support teachers, and selected classroom teachers at regional Steering Committee meetings. While the inclusion of these educators at regional sessions provided valued opportunities for collaboration and co-learning with their district facilitators (math, student support, and TELT leads), school teams advocated the importance of formal release time for facilitated support in their schools. In particular, district math facilitators: (a) provided important support to administrators leading learning at staff meetings; and (b) supported teachers' working with *students of mystery* across classrooms, and classroom teachers' implementing new instructional strategies. This facilitated support in schools was especially important for educators new to the project, as was the case for many administrators and teachers in Year 4.

Key Recommendations after Year 4

The following four recommendations have been identified to guide next steps for the EMP in Year 5 (2017-2018).

1. ***Maintain alignment with Renewed Math Strategy (RMS) and focus on students of mystery.***

   Continue to align regional project goals with the provincial Math Strategy (RMS). This alignment helps participating educators across contexts engage in cohesive professional learning and construct knowledge that informs instructional practice and students' learning in the province, region, districts, and schools. Furthermore, the RMS provides an enabling framework that supports precision in educators' learning and practice while allowing latitude to build on regional learning and momentum from Years 1 through 4.

2. ***Collectively identify precise regional objectives and develop monitoring plans.***

   Devote regional learning time at the start of Year 5 to identifying precise regional objectives for each guiding question, following the process of co-constructing success criteria. These objectives, or criteria, will inform the subsequent development of monitoring plans that can be used to guide data collection in the region, districts, schools, and classrooms throughout Year 5.

3. ***Increase depth of professional learning at regional Steering Committee meetings.***

   Provide consistent opportunities for deep professional learning at regional Steering Committee meetings, supported by external and district experts as appropriate. Ensure that these opportunities allow educators sufficient time to apply new learning (e.g., solving math problems, mapping developmental/conceptual continua onto math curriculum, developing and refining learner profiles, using the CASL method to analyze student work, exploring technology to support *students of mystery*).

4. ***Provide additional opportunities for facilitated learning in schools.***

   School-based educators require facilitated support of their learning and implementation within their own contexts of practice. This is especially important for educators who are new to the project and/or to collaborative inquiry in math. While facilitator support may be released gradually over time, it is critical in the initial stages when educators are planning, implementing, and reflecting on new practices. This support pertains not only to teachers in classrooms, but also to school support teachers who are fostering spread through their work across classrooms and school administrators who are beginning to lead learning in staff meetings and other school-based initiatives.

Appendix E: Summary of Year 5 Project Activities

EOSDN Regional Mathematics "Closing the Gap" Project
Year 5 Activities (2017-2018)

Project activities for Year 5 of the EOSDN Math Project followed a structure of going deeper in the learning and applying the learning more broadly through collaborative leadership within and across regional, district, and school contexts. As in the previous four years of the project, Queen's Researchers continued to support and/or refine the systematic collection and analysis of evidence of educator and student learning. All Steering Committee and Regional Learning meetings were co-planned and co-facilitated by project leads—Tammy Billen (Project Coordinator), Danielle LaPointe-McEwan (Queen's researcher), and Eleanor Newman (Project Director)—in collaboration with Connie Quadrini (Student Achievement Officer) and Math Experts (Christine Suurtamm and Heather Wark). Regional Ministry of Education personnel (i.e., Senior Education Specialist, Regional Student Success Lead, and Student Achievement Officers) also supported the learning.

2017-18 EOSDN Regional Mathematics Project Design		
Month	**Participants**	**Agenda**
September 7, 2017	Supervisory Officers; System Principals; Steering Committee Rep; Math Lead; Special Ed. Lead	Leveraging the Learning: Building upon the Regional Mathematics Project in DSBs
October 12, 2017	Administrators from DSB selected schools; Steering Committee Rep; Math Lead; Special Ed. Lead	Supporting School Leaders: 5 Key Areas of Practice-based Learning – Regional Mathematics Project Monograph
November 23, 2017	Administrators from DSB selected schools; School Math Leads; School Spec. Ed. Lead; Classroom Teachers; Steering Committee Rep; Math Lead; Special Ed. Lead	Supporting School Teams: Students of Mystery, Learning Profiles, LD in Mathematics External Expert: Connie Quadrini
December 14, 2017	Steering Committee Rep; Math Lead; Special Ed. Lead	Sharing/Consolidating the Learning in DSBS: Internal Experts: Steering Committee Math Leads, Ministry SAOs
January 11, 2018	Steering Committee Rep; Math Lead Special Ed. Lead	Grade 9 Mathematics Study Group External Expert: Christine Suurtamm
February 8, 2018	Administrators from DSB selected schools; School Math Leads; School Spec. Ed. Lead; Classroom Teachers; Steering Committee Rep; Math Lead; Special Ed. Lead	Supporting School Teams: Resources and Strategies for Students of Mystery in Mathematics External Expert: Connie Quadrini
March 7 & 8, 2018	Steering Committee Rep; Math Lead; Special Ed. Lead	K-3 Continuum of Learning in Mathematics External Expert: Heather Wark (Alex Lawson – What to Look For)
April 5, 2018	Steering Committee Rep; Math Lead Special Ed. Lead	Sharing the Learning: Internal Experts, Ministry SAOs Planning for May Consolidation

May 9-10, 2018 (Consolidation Days)	All participants in EOSDN Math Project 2017-18	Consolidating the Learning with School Teams; Analysis of Data, Initial Preparation of DSB Research Posters External Expert: Connie Quadrini
June 14-15, 2018	Steering Committee Rep; Math Lead; Special Ed. Lead	K-3 Continuum of Learning in Mathematics, Part 2 External Expert: Heather Wark (Alex Lawson – What to Look For)

September: Informing RMS Work in DSBs – Applying the Learning
Directors, Superintendents, System Principals and Steering Committee leads gathered to consolidate and share the learning from district and regional RMS work and to consider how to leverage this learning in the 2017-18 year. During the day, Board teams were engaged in:

- Identifying key elements of the EOSDN regional mathematics project found to be effective for student mathematical learning, and specifically for students who struggle in mathematics using the Development Evaluation Report and the monograph developed to assist the work of spread and sustainability of the learning.
- Identifying and sharing District School Board strategies for supporting implementation and monitoring of mathematics teaching and learning. Copies of the DSB research posters from the regional project were provided.
- Determining how to align supports for senior leaders, middle leaders and school leaders of mathematics by leveraging the learning from the EOSDN mathematics project and the work of DSB math leads and SAOs

October: Developing School Leadership – Applying the Learning
School administrators from the schools in the project joined the lead teachers from the DSBs and reviewed the regional monograph highlighting key elements of the EOSDN regional mathematics project found to be effective for student mathematical learning, and specifically for students who struggle in mathematics. Following an overview of the EOSDN Math Project Regional Inquiry guiding questions for 2017-18, DBS teams began developing plans for 'Paying Attention to Learning' in DSBs and participating schools through identified guiding question(s) in relation to BIPSAW, SIPSAW, RMS and EOSDN goals.

November: School Teams – Applying the Learning
School administrators and teachers involved in the regional Math Project joined with the DSB lead teachers in mathematics and special education for this day of learning. Participants studied key components of the EOSDN monograph, 'Making a Difference for Educators, Making a Difference for Students'. Connie Quadrini, Ontario Ministry of Education SAO, facilitated the learning: knowing and understanding 'students of mystery'/learning disabilities; deepening understanding of learner profiles; building content knowledge by 'doing the math'; and collaborative analysis of student math thinking. Administrators had the opportunity to participate in discussion with Connie and other administrators with a focus on structures, process and conditions for a whole school approach of learning.

December: Going Deeper and Applying the Learning
Teacher leaders in mathematics and special education from each DSB came together to go deeper into their own learning about the facilitation of adult learning of mathematics content and

pedagogy, inquiry design, the systematic collection and analysis of evidence of adult and student learning, and addressing the specific adult learning goals related to serving students with learning disabilities. Each DSB team shared their DSB guiding question and associated enabling questions and described how each role (i.e., DSB math leads and Special Ed leads) was supporting learning in their EOSDN schools, how a whole school approach is being cultivated in EOSDN schools, and how the EOSDN Math Project is contributing to system leading and learning in their DSB.

January: Grade 9 Applied Regional Study Group
The study focus was the learning of grade nine students enrolled in applied mathematics courses: recognizing the development stages of adolescent mathematical learning in grades 7-9, understanding strategies for applied mathematics learning, designing the learning environment, and describing strategies for noticing, naming and advancing the learning of students. Christine Suurtamm, University of Ottawa shared findings from her Grade 9 Applied Math Research (2014) to increase teacher knowledge of the curriculum and ways to implement the curriculum to address student need.

February: School Teams – Applying the Learning
School administrators and teachers involved in the regional Math Project joined with the DSB lead teachers in mathematics and special education. Connie Quadrini, Ontario Ministry of Education SAO, facilitated with the goal of knowing and understanding 'students of mystery' by further deepening participants understanding of learner profiles, content knowledge by 'doing the math', and collaborative analysis of student math thinking. A significant part of the day involved educators participating in simulations focusing on supporting students strengths and needs by deepening understanding of the cognitive domains. Educators directly referenced to the YCDSD document, Supporting Students with Learning Disabilities in Mathematics to determine next steps for the identified 'students of mystery'.

March: K-3 Regional Study Group
The focus was to develop greater fluency in supporting the learning of K-3 students. Components of the work include understanding the K-3 math curriculum, recognizing the development stages of mathematics learning, designing the learning environment, and describing strategies for noticing, naming and advancing the learning of students. Heather Wark (Lakehead University) facilitated two days of learning using the research of Alex Lawson and her resource: What to Look For.

April: Going Deeper and Applying the Learning
Teacher leaders in mathematics and special education from each DSB came together for the purpose of sharing and learning about effective supports for spreading the learning from the participating teams to other educators in the participating school and beyond. The teams participating in reviewing and refining a plan for the consolidation of learning with school teams in May.

May: Consolidation of Learning from Participating Schools
School administrators and teachers involved in the regional Math Project joined with the DSB lead teachers in mathematics and special education to share and analyze student learning. For each student of mystery, participating teachers brought the annotated learner profile, samples of student work including work on the math questions provided by Connie Quadrini at the November and February sessions, and reflections by the students on their learning and by the teachers on the

impact on their practice from participation in the study of strategies for addressing the learning strengths and needs of student with difficulties/disabilities in mathematics.
On day two, the core DSB teams analyzed the posted artefacts with guidance from Queen's researcher. The results of the analysis will form the basis of DSB research posters and the Developmental Evaluation Report.

June: K-3 Regional Study Group
Following the March session on the continuum of Mathematical learning of young students (kindergarten, grade one) , it was determined that Heather Wark (Lakehead University) would return for two more days of learning using the research of Alex Lawson and her resource: What to Look For to continue study of the continuum through the primary grades.

Consolidation of Year 5 Learning

District School Board Learning
A consolidation day was held in May with approximately 145 participants. These participants included district facilitators (math and special education), school administrators, teachers (support and classroom), and Student Achievement Officers. From the professional dialogue and the artifacts constructed by DSB teams, some encouraging themes emerged:

- Common approaches across grades and contexts—Educators are developing and using learner profiles to support *students of mystery* in math, using diagnostics and ongoing formative assessments to monitor students' progress and inform instruction, using tools to support students' learning and representation of thinking, implementing differentiated group instruction, and collaboratively analyzing students' thinking (e.g., CASMT).
- Prioritizing conceptual understanding—Educators are emphasizing conceptual understanding in instruction and assessment, prioritizing students' progression along conceptual continua over achievement of isolated, grade-level curriculum expectations.
- Supporting all learners—Educators are recognizing that strategies that support *students of mystery* support all students.
- Collaborative leadership is supporting spread—Educators involved in the project are spreading learning to colleagues within and across schools in their districts.

As part of the consolidation process, steering committee members spent a second day analyzing the data from Consolidation Day 1 with support from the Queen's researchers.

Regional Learning

Toward the end of Year 5 of the EOSDN Regional Math Project/study, the Queen's research partners gathered data from teacher participants, school administrators, district facilitators on the Steering Committee, and project leads. The combination of surveys and interviews adds to the classroom data from each district that is being analyzed and studied and is presented in the developmental evaluation report and project poster.

Appendix F: Data Collection Protocols

EOSDN Math Project Educator Participant Survey 2017-2018

Letter of Information/Consent Form This research is being conducted by Dr. Don A. Klinger, Danielle LaPointe-McEwan, and Adelina Valiquette of the Faculty of Education at Queen's University in Kingston, Ontario. This study has been granted clearance according to the recommended principles of Canadian ethics guidelines and Queen's policies and approved by the Eastern Ontario Staff Development Network (EOSDN) and your district school board.

What is this study about? Effective professional learning is critical to building educator knowledge and experience that supports enhanced instructional practice and improved student learning and achievement. Many current professional learning programs utilize sustained, classroom-embedded models that encourage reflection and collaboration among educators. Embedded in collaborative learning models are critical opportunities for reflection, exploration, developing inquiry habits of mind, and collaboration among teachers, school administrators, and program facilitators.

The purpose of this research is to develop a deeper understanding of the structures that support the success of collaborative educator learning initiatives in mathematics, where success is defined as the impact of the professional learning program on teacher practice, student learning and achievement, and collaboration among educators.

What will this study require? In your role as an educator, you have important insights and beliefs regarding the EOSDN Closing the Gaps in Mathematics collaborative professional learning initiative. We would like to invite you to complete a 20-minute survey regarding your experiences in this professional learning initiative. The results will be used to support our research. There are no known physical, psychological, economic, or social risks associated with this study.

Is participation voluntary? Your participation is completely voluntary, and you may withdraw from this survey at any time without adverse consequences by closing the browser. Further, you are free to choose, without reason or consequence, to refuse to answer any survey questions, with the exception of Question 1 regarding your current role in the project.

What will happen to my responses? Your responses will be kept confidential. At no time will individual educators, schools, or boards be named or evaluated. All survey responses will be amalgamated across EOSDN boards to inform our regional research. All electronic files will be password protected. Paper data will be secured in a locked cabinet. Only the researchers and research assistant attached to the project will have access to the data. We may also publish or present our findings in professional or academic journals and conferences. In accordance with the Queen's University policy, we will maintain data for a minimum of 5 years.

What if I have concerns? Any questions about study participation may be directed to the principal researcher Dr. Don Klinger at (613) 533-6000 x77273 or at don.klinger@queensu.ca. Any ethical concerns about the study may be directed to the Chair of the General Research Ethics Board at chair.GREB@queensu.ca or (613) 533-6081. Again,

thank you. Your interest in participating in this research study is greatly appreciated.

Access to this survey closes May 18, 2018.

If you agree to participate in this survey, please select 'YES' below to proceed to the survey. By completing the survey, you freely agree to participate in this survey. If you choose not to proceed, please close your browser to exit the survey.

Do you agree to participate in this survey?

- ○ Yes
- ○ No

1. Please indicate your **current role**. [check all that apply]

- ☐ Classroom teacher
- ☐ School support teacher (e.g., special education teacher, ISRT, school-based math facilitator)
- ☐ School administrator
- ☐ System math leader (e.g., facilitator, consultant, coach, coordinator)
- ☐ System special education leader (e.g., coordinator, SAT)
- ☐ System administrator
- ☐ Ministry of Education personnel (e.g., SAO)
- ☐ Other (please specify) _____

2. Please indicate your **district school board** (DSB).

- ○ ALCDSB
- ○ CDSBEO
- ○ HPEDSB
- ○ LDSB
- ○ OCDSB
- ○ OCSB
- ○ RCCDSB
- ○ RCDSB
- ○ UCDSB
- ○ N/A

3. In total, **how many years** have you been involved in the EOSDN Math Project?

- ○ Less than one
- ○ 1-2
- ○ 2-3
- ○ 3-4
- ○ 4 or more

4. Thinking about the EOSDN Math project, please **indicate the extent to which each of the following factors** has impacted your thinking and/or practice as an educator.

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
Focusing on relevant math content and pedagogical knowledge	○	○	○	○	○	○
Connecting math content and pedagogical knowledge to classroom implementation	○	○	○	○	○	○
Prioritizing connections between educator practice and student outcomes in math	○	○	○	○	○	○
Reflecting on how students interact with math content and pedagogy	○	○	○	○	○	○
Exploring our professional practice via collaborative inquiry	○	○	○	○	○	○
Aligning our inquiry with local priorities (i.e., student, educator, school)	○	○	○	○	○	○

Aligning our inquiry with system priorities (i.e., DSB, province)	○	○	○	○	○	○
Engaging in sustained collaborative inquiry for one academic year	○	○	○	○	○	○
Collaboratively analyzing relevant data from practice with my inquiry team	○	○	○	○	○	○
Prioritizing evidence from practice to inform our inquiry team's next steps	○	○	○	○	○	○
Learning collaboratively with my team at regional sessions	○	○	○	○	○	○
Learning collaboratively with colleagues from other DSBs at regional sessions	○	○	○	○	○	○
Learning collaboratively with my team in our context of practice (i.e., school or DSB)	○	○	○	○	○	○
Job-embedded release time to collaborate with my team	○	○	○	○	○	○

Ongoing support from leaders in my school and/or DSB	○	○	○	○	○	○
Ongoing support from knowledgeable others (e.g., math experts, special education experts, researchers)	○	○	○	○	○	○
Trusting professional relationships among educators in my team	○	○	○	○	○	○
Frameworks to support our collaborative inquiry (e.g., planning, reporting)	○	○	○	○	○	○

5. Thinking about your **students of mystery in math**, please indicate the extent to which your participation in the EOSDN Math Project has enhanced these students':

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
Confidence and risk-taking with math tasks	○	○	○	○	○	○
Engagement during math class	○	○	○	○	○	○
Ability to identify their personal strengths and needs in math	○	○	○	○	○	○
Understanding of math concepts (e.g., number sense, patterns, proportion)	○	○	○	○	○	○
Application of math strategies (e.g., using knowledge and skills in context)	○	○	○	○	○	○
Ability to represent math thinking in diverse ways (e.g., use of concrete materials, pictures, diagrams, numbers, words, and/or symbols)	○	○	○	○	○	○

Ability to communicate math thinking in multiple ways (e.g., orally, visually, and/or in writing)	○	○	○	○	○	○
Ability to use tools to support their thinking and representation (e.g., manipulatives, technology, visual representations)	○	○	○	○	○	○
Ability to make connections among math concepts	○	○	○	○	○	○
Achievement of grade-level math curriculum expectations	○	○	○	○	○	○

6. Thinking about your **instructional practice**, please indicate the extent to which your participation in the EOSDN Math Project has enhanced your:

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
Development and use of learner profiles to support students of mystery in math	○	○	○	○	○	○
Focus on leveraging students' strengths to support their needs in math (i.e., asset-based approach)	○	○	○	○	○	○
Differentiation of math instruction to meet students' needs	○	○	○	○	○	○
Understanding of math concepts on a conceptual continuum	○	○	○	○	○	○
Ability to name and notice where students are at on a conceptual continuum of number sense	○	○	○	○	○	○

Focus on addressing gaps in students' conceptual understanding versus gaps in skills	○	○	○	○	○	○
Use of number talks to support students' math learning	○	○	○	○	○	○
Use of multiple representations to support students' math learning (e.g., number lines, arrays, area models)	○	○	○	○	○	○
Use of thinking tasks to support students' math learning	○	○	○	○	○	○
Use of tools to support students' thinking and representation in math (e.g., manipulatives, tech, visual representations)	○	○	○	○	○	○
Implementation of assessment for, as, and of learning in math	○	○	○	○	○	○
Documentation of students' math learning using multiple methods (e.g., paper-based and digital)	○	○	○	○	○	○

Triangulation of multiple forms of evidence to inform math instruction	○	○	○	○	○	○

7. To what extent has your participation in the EOSDN Math Project impacted the following aspects of **classroom math culture**:

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
Valuing risk taking and learning from mistakes in math	○	○	○	○	○	○
Focusing on thinking and understanding different approaches to solving math problems	○	○	○	○	○	○
Valuing student voice in math discourse	○	○	○	○	○	○
Students using tools to support learning (e.g., manipulatives, technology, visual representations)	○	○	○	○	○	○
Students solving problems collaboratively	○	○	○	○	○	○

8. To what extent has the EOSDN Math Project impacted the following aspects of **school math culture**:

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
1	○	○	○	○	○	○
Educators making connections in math curriculum content across grades	○	○	○	○	○	○
Educators developing, using, and refining learner profiles to support responsive instruction of students of mystery	○	○	○	○	○	○
Educators implementing asset-based approaches to math teaching and learning across classrooms	○	○	○	○	○	○
Educators using common math language to name and notice students' learning	○	○	○	○	○	○
Educators using common approaches to support students' math learning (e.g., number talks, manipulatives, technology)	○	○	○	○	○	○

School support teachers spreading common math language and instructional approaches across classrooms	○	○	○	○	○	○

9. To what extent has the EOSDN Math Project impacted the following aspects of **DSB math culture**:

	A great deal	A lot	A moderate amount	A little	None at all	Not applicable
Integrating EOSDN Math Project goals with RMS and BIPSA goals	○	○	○	○	○	○
Fostering collaboration among DSB educators across department	○	○	○	○	○	○
Implementing central professional development sessions focused on EOSDN Math Project goals	○	○	○	○	○	○
Spreading learning to schools outside the EOSDN Math Project through Special Education system leads and school support teachers	○	○	○	○	○	○

10.a) Does your **approach to assessment** differ for students of mystery in your classroom? If so, please describe how.

10.b) How do **different forms of assessment** (e.g., diagnostic, formative, summative) support the learning of your students of mystery?

11.a) Please describe the most notable change you have observed in **students' learning** as a result of your involvement in the EOSDN Math Project?

11.b) How do you know this change in **students' learning** has occurred? (i.e., What is your evidence?)

12.a) Please describe the most notable change you have observed in **educators' practice** as a result of your involvement in the EOSDN Math Project?

12.b) How do you know this change in **educators' practice** has occurred? (i.e., What is your evidence?)

13. An aspect of the EOSDN Math Project that should be **maintained** is:

14. An aspect of the EOSDN Math Project that could be **improved** upon is:

15. **Moving forward**, how will your practice look different as a result of your involvement in the EOSDN Math Project?

Thank you for your time and insights!

Project Lead Questionnaire

The purpose of this questionnaire is to gather information regarding your experiences with the EOSDN Math Project (2017-2018). We greatly appreciate your time and insights regarding the project.

1. How has your involvement in this project impacted your thinking about collaborative inquiry, teaching, and learning in math?

2. What specific evidence do you have that the EOSDN math project has had an impact on math teaching and learning in the region?

3. How has the RMS influenced your work within the EOSDN math project over the past year?

4. Thinking about this EOSDN initiative, what are the greatest needs for the DSBs and educators involved?

5. If you could make 2 suggestions for the next phase of the EOSDN math initiative, what would you suggest?

Appendix G: Selected Artifacts

Regional Steering Committee Meeting
May 2018