

**PDIG 2019-2020 REPORT: ELEMENTARY MATH FOCUS PROJECT: A PLC TO SUPPORT TEACHER'S LEARNING FROM TEACHING**

**1. Project Description**

**Describe/show to what the degree the project was carried out as planned.**

The project involved 15 teachers from 11 SWL elementary schools. All teachers are graduates or current participants of the Math Summer Institute. Funding for this project has come from two PDIG grants<sup>1</sup> and a board grant.

Math Summer Institute Teachers Participated in the PLC					
Cycle	Number of Teachers	Cohort 2	Cohort 3	Cohort 4	Cohort 5
Kindergarten	1			1	
1	4		1		3
2	3		2		1
3	7	1	4	1	
Resource	2		1		1

**Description of Activities**

Teachers attending Math Summer Institute have benefited from ongoing support between the summer sessions. Support has centered on building a community of math teachers and a common vision for effective mathematics teaching that provides equitable access to math learning for all students. Ongoing support has taken on many formats, one of which is a Professional Learning Community (PLC). For four years, a PLC for Math Summer Institute teachers has aimed to support teacher’s reflection on practice, use of evidence from the classroom (e.g., student work) to analyze teaching, and, for those who have had more experience with the PLC, opportunities for leadership roles. This year a leadership role has involved opening their to a model a lesson for other teachers. This opportunity was available to all teachers participating in the PLC. However, only the more experienced teachers (Math Summer Institute graduates) opted to host a classroom observation session.

Similar to previous years, the PLC this year involved two types of PD sessions, co-planning sessions and classroom observation sessions. The PDIG grant was used to release teachers for the co-planning sessions and the board grant was used to release teachers for the classroom observation sessions. Six co-planning sessions and three classroom observation sessions for each teacher was proposed however, as a result of the school closures, three co-planning sessions and five classroom observations were scheduled (October 2019 to February 2020). To provide a complete picture of the project, I will report on the activities and outcomes related to the co-planning and classroom observation sessions.

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<sup>1</sup> I submitted the project proposal for one of the PDIG grants and took over the second PDIG because the lead consultant was on leave this year. Given that both projects are the same, I merged the teachers from both groups.

***The Co-Planning Sessions involved:***

- sharing reflections on the classroom visits (if applicable).
- bringing evidence of student learning to discuss student thinking, the effectiveness of the lesson and how the lesson could be modified in the future.
- discussing learning goals, strategies for representing mathematics and teacher questioning.
- discussing personal goals for improving practice.
- sharing resources to address any challenges teachers raised (e.g., research-based practices and video-clips).
- co-planning and designing a math lesson, drawing from new knowledge gained from video-analysis, literature, or the group discussion.

The second type of session was a classroom observation. At the beginning of the year teachers were encouraged to attend a maximum of three classroom observation sessions. With the school closures, this was not feasible, however the majority of teachers attended at least one classroom observation. In particular, 1 teacher attended 3 observation sessions, 6 teachers attended 2 observation sessions, 6 teachers attended 1 observation session, and 2 teachers did not attend any observation sessions.

***The Classroom Observation Sessions involved three phases:***

- Phase 1: The pre-observation meeting focused on discussing the role of the observer(s) and reviewing the Lesson Analysis framework, to be completed by each teacher. That is, all teachers observing a lesson were asked to use the Lesson Analysis framework to focus their observations on student thinking and teacher questioning, and use elements of the lesson to discern the learning goal.
- Phase 2: Observe lesson in action.
- Phase 3: The debrief meeting focused on the lesson's learning goals, teacher questioning, and student thinking that stood out during the lesson. I also emphasized any of the eight shifts in practice (NCTM, 2014; outlined in the next section) that stood out to highlight how the teacher effectively modeled that practice during the lesson.

**Include what went well and what proved to be a challenge.**

The PLC was unable to carry out all six co-planning sessions, which limits my ability to evaluate the effectiveness of the PLC this year. Indeed, normally I would spend part of the last co-planning session asking for their input for what worked well and what should change moving forward. Although I did not have the opportunity to collect feedback from all teachers, I did receive feedback from some of the teachers at the end of the co-planning sessions. The feedback in general was positive and teachers saw value in sharing activities and discussing their implementation.

Teachers who shared this feedback with me were the teachers who had only completed one year of Math Summer Institute and the teachers who for the first time this year, opted to teach

without a workbook. The teachers who did not use a workbook this year described how lesson sharing, the opportunity to share challenges with the group and receive feedback during the co-planning sessions provided them with a great deal of support. During the co-planning sessions I would also meet with these teachers individually to discuss how to sequence the topics to promote a connected a coherent understanding of the subject.

Another element that worked out well this year was the group's heterogeneity regarding their PD experience. I considered teachers as experienced if they completed all three years of Math Summer Institute and participated in this PLC for at least two years. I considered the teachers that completed two years of Math Summer Institute and participated in this PLC for 1 year as intermediate. Novice teachers completed one year of Math Summer Institute and participated in this PLC for the first time this year. The group had 8 experienced teachers, 2 intermediate teachers, and 5 novice teachers. Given the high number of experienced teachers this year, I tried to step back more often during discussions to support experienced-novice teacher interactions. I believe prompting these interactions contributed to their professional growth in different ways. That is, I noticed that these interactions inspired novice teachers to implement less traditional math tasks and for the experienced teachers, the interactions provided opportunities to take on a mentorship/coaching role. Had we had the opportunity to continue the co-planning sessions, I would have continued to create opportunities for teachers to learn from teachers.

Finally, there was a great deal of enthusiasm to participate in classroom observation sessions. Indeed, for some sessions, there were as many as 9 teachers observing the lesson. The Lesson Analysis framework was new this year and supported very productive discussions about the lesson during the debrief. Based on their Lesson Analysis, I believe that providing teachers with guidance on what to focus on when observing the lesson allowed for greater attention to the lesson's learning goals and student thinking. This will be discussed further in the following section. It is, however, difficult to say this with certainty given that only five classroom observation sessions took place and the majority of the teachers were able to participate in one classroom observation session. My goal was to schedule at least two more classroom observations before the end of the year (the sixth classroom observation was scheduled to take place on April 30).

While having a relatively high number of experienced and novice teachers in the group creating a good group dynamic, including 15 teachers made it difficult for me to distribute participation to all teachers during the co-planning sessions. Also, because of the high number of teachers a great deal of time was allocated to lesson sharing at the expense of co-planning.

### **Include a synthesis of your journal entries**

The journal entries included a summary of the activities during the three co-planning sessions. In addition, certain shifts were underscored based on the focus of our discussions. Specifically,

for the first and third session, the group discussion focused on selecting and implementing rich tasks that promote reasoning and problem solving (Shift 2). For the, the second session, the majority of the lessons shared highlighted the importance of helping students visualize the mathematics, which was a great opportunity to discuss teaching that uses *and* connects mathematical representations (shift 3).

The journal entries also summarized what was presented and the resources shared (outlined below).

## Resources Shared

### Building Classroom Culture

<https://www.saravanderwerf.com/100-numbers-to-get-students-talking/> .

### Classroom Routines to Support the use of Problem Solving

- <https://earlymath.erikson.edu/exploring-3-reads-math-protocol-word-problems/>
- Problem Solving Strategies Poster
- Talk Moves poster

### Resources for Rich Tasks

- <https://www.mathreasoninginventory.com/Home/Resources>
- <https://tapintoteenminds.com/3act-math/>
- <https://gfletchy.com/3-act-lessons/>
- <https://whenmathhappens.com/3-act-math/>
- <https://www.youcubed.org/>
- <https://nrich.maths.org/>

Jo Boaler, Jen Munson and Cathy Williams. *Mindset Mathematics: Visualizing and Investigating Big Ideas*, Grade 3 (2018), 4 (2017), 5 (2018) and 6 (2019).

### Research-related Resources

- England, L. (October, 2010). Raise the bar on problem solving. *Teaching Children Mathematics*, pp 156-165.)
- Empson, S. B. and Levi, L. (2011). *Extending Children's Mathematics Fractions and Decimals: Innovations in Cognitively Guided Instruction*.

## 2. Project Goals and Outcomes

### Describe/show to what degree the goals of the approved project were met.

In line with the research on developing a teacher's professional vision, the goals of the PLC were the following:

- developing and sharing new resources
- developing a reflective stance

- rethinking activities that define being a teacher
- deepening subject matter knowledge for teaching
- learning from teaching as a part of a community

**Describe or show the gains that the participating teachers achieved through this project.**

***The development of high-cognitive demand tasks following the TQE Process***

Nineteen lessons were shared with the group and several teachers successfully integrated the research-based practices raised during the sessions (e.g., Dan Meyer, Cognitively Guided Instruction, Jo Boaler). I analyzed each task to determine the number of attributes of a rich task their tasks addressed (Boaler, 2015; Stein et al., 2009). The table below indicates the number of highly rich tasks (5 to 7 attributes), rich tasks (3 to 4 attributes), and non-rich tasks (1 to 2 attributes) shared at the co-planning sessions. I examined the quality of tasks as a function of a teacher’s prior experience with this PD (i.e., experienced, intermediate and novice).

The table below shows that the experienced teachers shared more lessons, a high proportion of which were highly rich tasks and rich tasks.

<b>PD Experience</b>	<b>Number of Highly Rich Tasks</b>	<b>Number of Rich Tasks</b>	<b>Number of Non-rich Tasks</b>
<b>Experienced (8 teachers)</b>	<b>6</b>	<b>7</b>	<b>1</b>
<b>Intermediate (2 teachers)</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>Novice (5 teachers)</b>	<b>1</b>	<b>1</b>	<b>1</b>

***Engaged teachers in ongoing reflection to improve teaching and learning***

Teachers completed a self-evaluation form<sup>2</sup> to report on their shifts in eight effective teaching practices (NCTM, 2014). The eight effective practices include:

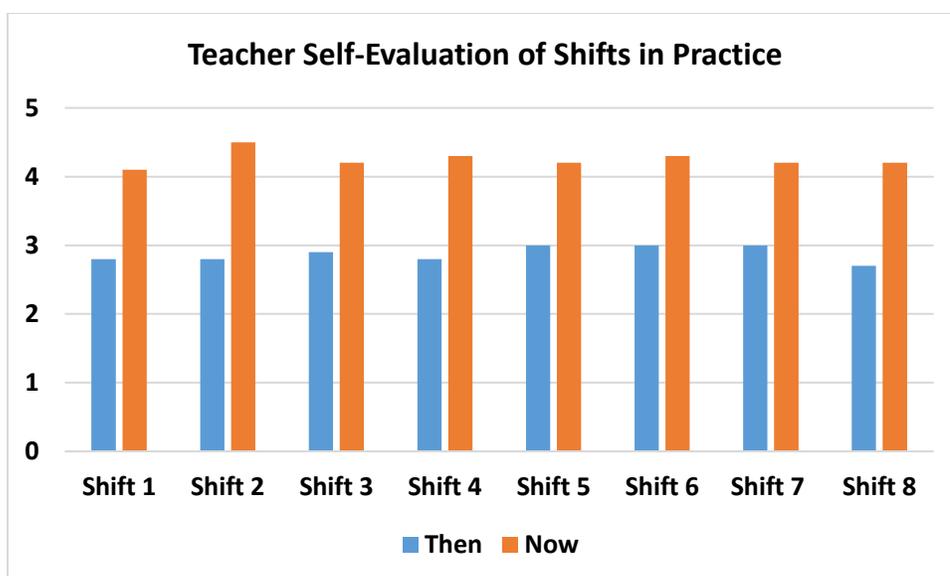
- Shift 1: Establish mathematics goals to focus learning.
- Shift 2: Implement tasks that promote reasoning and problem solving.
- Shift 3: Use and connect mathematical representations.

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<sup>2</sup> Teachers were recently asked to use a scale of 1 to 5 to best represent their classroom practice for each shift at the beginning of the year (i.e., then) and at the end of this year (i.e., now). A “1” represents a traditional view of each practice and a “5” represents a view of mathematics teaching supported by research.

- Shift 4: Facilitate meaningful mathematical discourse.
- Shift 5: Pose purposeful questions.
- Shift 6: Build procedural fluency from conceptual understanding.
- Shift 7: Support productive struggle in learning mathematics.
- Shift 8: Elicit and use evidence of student thinking.

Growth in shifts 1 (establishing focused learning goals), 3 (using and connect mathematical representations), 4 (facilitating meaningful math discourse), 5 (posing purposeful questions) and 8 (eliciting student thinking) were anticipated given their alignment with the PD activities (i.e., focus on representing mathematics in meaningful ways, teacher questioning, and noticing and interpreting student thinking) and my qualitative descriptions of the teacher's Lesson Analysis (described later on).



The graph, however, shows that teachers reported experiencing growth in all eight shifts, with the greatest growth in shifts 2, 4 and 8. The teacher self-evaluation suggests that this year's PD had a positive impact on improving their mathematics teaching. It is also important to note that all teachers reported pedagogical growth, with the exception of 1 teacher who scored themselves at 4 or 5 for all eight shifts. Irrespective of a teacher's level of experience with this PD initiative, the group, for the most part, experienced growth on all eight shifts. Although this is based on self-reported data, this evaluation supports a common vision for effective mathematics teaching and links the PLC with positive changes in teaching.

***The Adoption of teaching practices that move away from traditional forms of math instruction to improve student learning***

Moving away from traditional forms of math teaching is necessary to promote math teaching that provides access to math learning for all students. Teachers in the PLC relied less on traditional forms of teaching and adopted the models and approaches to teaching discussed during the PLC/Summer Institute. This was demonstrated through the lessons shared at the co-planning sessions and the lessons developed for the classroom observation sessions. Indeed, I analyzed each of the five classroom observation lessons using the eight shifts as a framework. All five lessons effectively incorporated practices to support shifts 2, 3, and 8; four lessons modeled shifts 6 and 7; three lesson modeled shift 4; and one lesson effectively modeled shift 1. Taken together, the majority of the teachers incorporated 5 of the 8 shifts in their practice.

### ***Gains in a deeper understanding of math content for teaching***

At every co-planning session I would extend the discussion of a teacher's math lesson by referencing relevant research-based strategies to represent mathematics. Discussions about math content was also addressed during the debrief phase of the classroom observation sessions, particularly when we discussed the learning goals of the lesson.

Skills necessary for identifying a learning goal rely heavily on a teacher's subject-matter knowledge. With this in mind, I analyzed the learning goal section in the teacher's Lesson Analysis to see whether facilitating discussions during the co-planning sessions would support their ability to identify a lesson's learning goal and articulate the mathematics the lesson focused on. For 3 of the 5 classroom observations, all teachers were able to identify the lesson's learning goal and included learning goal statements that specifically described the mathematics to be learned. For 1 classroom observation session, only 1 teacher in the group was able to discern the learning goal. All other teachers participating in that session misunderstood the learning goal as a result of their focus on student thinking. That is, their learning goal statements indicated that they did not also consider the task used during the lesson to establish its the math focus. For 1 classroom observation half of the teachers accurately identified and articulated the learning goal. While these results are promising, more sessions are needed to further develop this skill.

I also analyzed teacher's Lesson Analysis to examine the extent to which their observations focused on the task, student thinking, and teacher questioning. That is, I looked at the statements included in the section that prompted teachers to record noteworthy examples of student thinking and the section allocated for teacher questions/prompts to understand what they focused on when observing the lesson.

Research on teacher noticing has shown that teacher's skills in noticing and interpreting student thinking are learned and do not natural develop with teaching experience (Jacobs et al., 2010). Further, prior to developing this skill, teachers tend to focus on the teacher only when evaluating a lesson, which limits opportunities to collect evidence of student thinking (vanEs et al., 2017). It becomes important, then, to shift the focus on teaching only

to the interaction between student thinking and teaching. This shift is necessary to evaluate the effectiveness of a lesson and supports teaching practices that centralize student thinking and adaptive teaching (vanEs & Sherin, 2008).

Teachers participating in the earlier classroom observation sessions focused their observations on the expectations of the task and teacher questioning. Specifically, in the sections designated to note examples of student thinking, the teachers would record what students were expected to do to complete the task as opposed to writing examples of student thinking observed during the lesson. Contrary to this, the same teachers would use the section allocated for noticing teacher questioning to write the questions/prompts that stood out to them. This pattern changed for the last two classroom observation sessions in January. That is, very few teachers would use either section to describe the task, all teachers included relevant teacher questions/prompts, and the majority of teachers were noticing and describing different student strategies. This trend may suggest that the focus on student thinking may not be intuitive at first, but the discussions during the debrief of the classroom observation could have underscored the importance of interpreting student thinking when analyzing teaching.

Together, growth in their skills in establishing learning goals and connecting student thinking with teaching stands to impact their classroom teaching in ways that promote greater student engagement and understanding of the subject.

#### **4. Reinvestment**

**Clearly describe how the resources created and/or the learning achieved by the participants can be of benefit to the educational community at large.**

Reinvestment of what was produced in the PLC (i.e., the math lessons) this year will be included in online resource that will be made available for the upcoming school year, extending the resources to all teachers. The idea to use an online platform (Google Site) only emerged during the third co-planning session. Although the site is not available now, this link to a Google Drive folder includes 5 TQE lessons [EMF PDIG 2019-2020](#).