

## **Our Teaching Learning and Leadership Program (TLLP) Project: A School Wide Approach for Teaching Mathematics**

### **Context:**

School mathematics programs have undergone significant changes over the last twenty years and more importantly, the role of the teacher has begun to shift from a dispenser of knowledge to a facilitator of knowledge, one who orchestrates learning through effective questions, contexts and discussion (Stein, Engle, Smith, & Hughes, 2008) prodding the learner to construct their own understanding. This new role is central to the instructional practice known colloquially as, *reform*. Stein, Engle, Smith, and Hughes (2008) contend that over the last twenty years of reform instruction development there have been two waves of implementation: the *first generation* and the *second generation*. Their idea of first and second generation does not refer to the chronological age of the teachers, but rather to a philosophy or stage in the progression of understanding effective reform instruction. They observed that in the first generation of reform the roles of the teacher and of the students were not well defined. The emphasis was placed on encouraging the students to think through problems, and then praising students for their unique strategies. The congress, or whole group discussion time, was used as an opportunity to practise listening skills; teachers' questions tended to focus on having students explain why they used a particular strategy or asking students to explain their strategies further. Many teachers felt that in order for discussion to be focused on student thinking, teacher thoughts or interjections were to be avoided; both teaching and learning needed to come from the students (Stein et al., 2008, p. 316). Stein et al. added that in the first reform generation, students' strategies often became inefficient; students and teachers would remain stuck on how to move towards more efficient strategies or how to move towards connecting the strategy to a bigger mathematical idea.

With this current research on our minds we wanted to focus on mentoring our teaching staff, at our school, in implementing a problem based approach to teaching mathematics. Being a brand new balanced calendar school, we felt that this project would allow us to build deeper mathematical capacity in our teachers and our students. The team felt that by following a co-planning, co-teaching and co-debriefing teachers

would develop a better understanding of the three-part lesson and an understanding of the progression of our students in math. The team also felt that this project would also help build a cohesiveness among our staff and allow us, as a school, to have a consistency in math language and expectations on a grade level and school level.

### **The project:**

The initial plan for the project was to focus on researching teacher questions in a mathematics setting so that teachers might reflect on, and assess how their questions were impacting the learning of their students. However, this changed when we brought the project back to the school. It was always our intention to incorporate the whole school in the project. The reason for this was that it was our school's second year since opening and we felt that this would build capacity in our teachers and bring more cohesiveness to the climate of the school.

Our first step was to conduct a staff survey examining what their views on math were; the survey results revealed that most teachers didn't regard themselves as mathematicians and had a somewhat low self-esteem about their ability to teach math. Though this was expected we felt that, combined with their thoughts on how often they used open-ended problems in the classroom, our project's direction should be focused more on building capacity in a school wide approach to teaching mathematics rather than continue with the initial focus on teacher questioning.

For the project the team brought the proposal forward to our teaching and learning committee to discuss how best to implement it in our school. It was decided that three Professional Development (PD) sessions would be used to talk about math and that staff would be introduced to *Instructional Rounds* (City, Elmore, Fairman & Teitel, 2010) as a model for conducting co-planning, co-teaching, and co-debriefing. According to City et al. (2010) the purpose of *Instructional Rounds* is to allow teachers to enter into a deep and meaningful conversation about their practices. They noticed that the greatest barrier to school improvement was the lack of definition concerning what standards the school wished to participate in. The committee felt that for the project to be meaningful to our school we had to go beyond traditional PD, and move into a realm where teachers felt comfortable discussing their practice and teaching in front of others.

The committee and team set three learning goals:

- 1) Make teaching mathematics through problem solving a school wide goal
- 2) Engage our staff in a growth mindset that everyone is and can be a mathematician
- 3) Improve our students' learning of mathematics through a problem solving approach to both teaching and learning

We also made an if then statement:

If, as a team, we engage in a balanced approach following targeted practices (e.g., practice of math facts and processes, use of rich, open-ended problems, accountable talk, probing questions, strategy-building, co-constructed criteria and descriptive feedback) to improve numeracy and problem solving, student engagement, confidence and communication strategies, then our students will become more successful critical thinkers and problem solvers, and more aware of the world and their role in it.

The project started with [our first PD session](#)<sup>1</sup> focusing on the following questions: what is reform mathematics and why teach through problem solving? We introduced the staff to the team's definition of Problem Solving and provided them with opportunities to dive into authentic problem solving and open discussion about what problem solving is. During this PD session teachers solved a fraction problem, observed students working, and thought about assessment. We also facilitated dialogue about our own teaching practices and if this was the best approach to teaching mathematics.

Our second PD session<sup>2</sup>, which was less formal and contained a variety of hands-on components, examined planning lessons and using them in the classroom. The

---

<sup>1</sup> <https://docs.google.com/presentation/d/1qyANR7norrHT9ivLrc-UsAWZzm7gAIYUwQPVB5BJbeE/present?pli=1&ueb=true&slide=id.p>

<sup>2</sup> <https://docs.google.com/document/d/1eJIA0bZTRb-JaZcSb3KrmEC3NL0tK9pQWBMRyeygE/edit?pli=1>

teaching and learning team created two templates for the staff to use. The first was a template for a three-part lesson<sup>3</sup> and the second template was a unit planner. There was much good discussion about how mathematics has changed, what is best for our students, and what each classroom should look like, sound like, and act like. We also talked about our core beliefs and values as mathematics educators. During this PD session teachers were able to co-plan a lesson that they would also be co-teaching together. This started trial number one<sup>4</sup> which we would debrief at our next staff meeting.

For this trial and all subsequent trials the project was given release time for a co-teaching, co-planning and co-debriefing model. This model included a half day release to co-plan with members of the team, a full day to teach a lesson in both classrooms and then debrief the learning. During the planning session the teams used the help of our Resource Teacher (RT), the teacher Librarian and the TLLP team. Our administration team was able to attend all of the sessions and contributed in the debriefing. The total amount of days equaled to 50.

At the next staff meeting the teachers shared their thinking on how their lessons went. As a staff we noted the similarities and differences with each lesson, as well as, participated in an honest conversation about how to make them better. Some of the observations included:

- 1) Teachers were amazed at the abilities of their students.
- 2) They were surprised at the diversity of strategies and what this brought out in their math groups.
- 3) Many struggled with how to assess this type of talk and how to communicate this learning to parents.
- 4) Out of this conversation and experience many of the staff noted the importance of teaching through problem solving.
- 5) They observed the benefit to student thinking and conversation and experienced the enrichment that it brought to their program.
- 6) Some students had a hard time working together during the problem solving task.

---

<sup>3</sup> <https://docs.google.com/document/d/1Soc-tkGgHtgFZeS227HviCssD0qpHpKvg0BVmZ-c7tc/edit?pli=1>

<sup>4</sup> <https://drive.google.com/folderview?id=0B4245QONE7HaT0dSQXIPeIRNMEk&usp=sharing>

These observations were taken back to the teaching and learning committee who then located and provided academic articles to support the staff in overcoming the hurdles. These articles included *Looking at orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell* by Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008), *Classroom discussions: Using math talk to help students learn, Grades K-6* written by Chapin, S. H., O'Connor, C., O'Connor, M. C., & Anderson, N. C. (2009), and my own research on the impact of teachers' questions in students' learning of part-whole relations and benchmark model in fractions (2014). These articles were shared at the division meetings and teachers had time to read and reflect on what was being presented

The final PD session attempted to address the observations and concerns that the staff was having around community building, choosing rich tasks and assessment. During this meeting the staff had some time to discuss their "post article reading" reflections. Teachers were also given time to co-plan their next lesson<sup>5</sup> with a focus on incorporating language or a richer context than the one they used previously. The lesson was then co-taught and debriefed in order to prepare for the next staff meeting discussion. At this staff meeting we once again had an open discussion about our progress, if any. We shared and charted our students' findings and lessons. The staff participated in a gallery walk moving around the room, looking at all the chart work that had been going on. Here is what we observed:

- 1) Teachers were once again amazed at the engagement of their students.
- 2) Teachers commented on how easy it was to integrate literacy into their math program.
- 3) Teachers felt they had created a more balanced approach to planning and teaching.
- 4) Students were more engaged with the problem.
- 5) Students had become better communicators of their strategies.
- 6) Students were better at working together in partners and learning in groups.

---

<sup>5</sup> <https://drive.google.com/folderview?id=0B4245QONE7HaZ01sOXIZVW9LUXM&usp=sharing>

Our final step in the project was to conduct a post survey to explore what the staff had learned and how they had changed.

### **What Our Staff Learned:**

One of the most revealing questions in the post survey was: what did you learn from this process and where would you like to see our learning go? Here is what the staff wrote:

- 1) There is true engagement when students are working with real life problems.
- 2) How to use questions more effectively to move students forward in their learning.
- 3) I would say that I'm so proud of how well my students can orally communicate their thinking now and explain their understanding to others.
- 4) I learned the importance of co-teaching, and co-planning and that it is the way to go:) loved doing this as a team.
- 5) I have learned how rich problems and accountable talk created more confidence in my students.
- 6) My greatest learning has been working with individuals and trying to meet all of the needs of the staff. It has been great to see how people work and how we can meet all of our goals together.
- 7) I have grown a lot in my understanding of the three-part lesson and the types of rich tasks that are appropriate for this kind of teaching and learning. I learned how to facilitate a math congress effectively in order to consolidate student learning.
- 8) The greatest experience that I have had is the collaborative aspect of planning and modifying with my teaching partner. I also find it incredible the learning that happens with seven year olds. The strategies and discoveries the students make and how they feed off each other is incredible.
- 9) The greatest experience I have had is in understanding how to pose critical questions during the consolidation phase of lessons in order to enhance the learning experiences of the students and tap into their thinking process.

- 10) Exploring alternative practices to teaching math and how the students can be challenged more than I would have thought and produce more than I expected. I feel like I have learned more in this year of teaching math than I have in the last several combined!
- 11) The greatest learning I have had is that even when I use the same lesson with a different set of students it can produce completely different outcomes! As teachers we have to be prepared for these possible outcomes.
- 12) I learned the importance of following up with my students: to use their conversations as assessment or to clarify what they were trying to communicate with their work
- 13) I learned how valuable it is to plan as a team, talk about instructional strategies, how to ensure all students are engaged, and look at assessment as part of the planning. Time to moderate student work is very helpful. It is very effective to hear student reflections on the work and processes as we continue to build strategies. I also think the planning, 3-part lesson, added to the success a great deal.

### **The Staff's Next Steps:**

We also collected data on where the staff would like further PD in mathematics. Here are the results:

- 1) There needs to be more work in understanding how to assess the oral conversations we have with students.
- 2) To continue to learn what teachers need to learn to be effective Math teachers and build a continuum for individual students
- 3) I would like to continue growing in my ability to ask effective questions during this process as well as creating detailed observations of students' thinking during the activity. I would also like to become more confident in assessment.
- 4) I will keep teaching using this approach and start challenging myself to integrate more technology and a cross-curricular approach to math.
- 5) Continuing to explore teaching resources that are available (e.g. Marilyn Burns book)

- 6) Seek more opportunities for co-teaching (not just co-planning)
- 7) Continue to work on open ended questioning
- 8) I will continue to build a comprehensive balanced math program allowing for large blocks of time every day if possible, collaboration for students-working in pairs and to try to incorporate rich authentic problem solving tasks more regularly as part of the program. I want to continue to give the students lots of time to learn about how to use manipulatives, to see different ways of recording their solutions, and time to practise and share orally, justifying their work with others. Students will become more proficient at explaining their solution.
- 9) Creating a bank of questions to probe students' thinking, broken down by strand
- 10) To build good questioning and critical thinking as a staff
- 11) Understand how math is developed in students from K-5
- 12) Move from first generation reform teachers towards a second generation of reform. --> move now from Problem Based Learning (PBL) sharing to PBL learning.
- 13) Continue incorporating both technology and social justice into our mathematics program.
- 14) More hands on workshops that teach us about available resources
- 15) More like the TLLP that we did - one of the best things about the TLLP is that it FORCED us out of comfort zones and had us trying new things and exploring things that we did not know before. It was all applicable and useful to the classroom, because it was happening in the classroom! The best PD is useful PD!
- 16) Continue to keep Math in our SSP (School Success Plan) goals (not just literacy)
- 17) Helping students extend their understanding of math as it occurs in their everyday activities
- 18) It would be great if we can continue to build this into our Collaborative Inquiries next year. This year, the gift of time from the project helped us all grow as a school. Maybe Part two of a grant next year?

**Personal Learning and Leadership Growth:**



For me the critical learning was in the process of coming together as a staff to talk about our teaching practice openly and professionally. As teachers we often feel very isolated within our four walls and yes we do have rich staff meetings but rarely is there time for authentic discussion. This actually started to happen during this project. In addition, the learning and growth of the teachers was amazing. We went from a school that taught math as individuals to a staff that has a common language, a common purpose, and for the most part, a common practice. The majority of our staff now use problem solving as a primary teaching tool. The students are becoming better problem solvers, communicators, and critical thinkers.

My personal learning has been how to clarify a vision and build it within a school community. Before I started this journey I thought that a vision could be communicated easily and then, with careful planning, implemented. I learned it takes more than that. Building connections among staff members is critical, understanding what others think, honouring their opinions, and finding how everyone can fit into the vision is all part of the process. For a school wide approach to take hold it takes strong individuals to lead but it also takes patience, guidance and understanding for it to sustain itself. This process was not about bullying my way through people to get the project done but by understanding how to encourage all learners to see the bigger picture. It taught me that a leader needs to have a clear vision but also an understanding heart. A leader needs to see who is on their team, where their understanding is, and how to assist them in their learning and growth. It taught me to always see the good in people, that resistance is not always about not wanting to change but that people don't know how and it is the job of a leader to understand where they can assist.

### **Challenges:**

You cannot implement a school wide focus without thinking you will face challenges. It takes a team (support staff, teacher librarian, various committees, resources teachers, and the board various networks) to make a vision and plan come together. Most of the challenges we faced centered on understanding how to implement these math changes or why they needed to be done. The staff went through PD sessions, where all voices

were heard and all ideas were accepted. This led to valuable discussions around why teaching through problem solving was a school wide goal. There were also challenges in working together as a staff. As a staff we had to do some work around norms of collaboration, building trust with others and building a community. This was overcome with the help of our principal and dialogue amongst staff. As much as this was a teacher led initiative it needed the support of our administration as well. Working with your admin team also takes the same patience and understanding as working with your colleagues. I also think that any project on a school wide scale needs to be supported by the principal as Head Instructional Leader. Having the support and vision of the admin can move certain conflicts along and also help build that sense of community.

### **Sharing Our Research:**

Since our project has ended, our Board has been implementing *Engage Math*. This is a district wide focus on teaching a balanced mathematics program. Using the board's ideas and our own research we have continued to build capacity in our staff. We have had two further PD sessions<sup>6</sup> on math and implementing math in the classroom. We have also been sharing any resources that we have created from the project with other school in our network and district. I have also been asked to come out to Waterloo Separate Board and share our journey with them.

### **Conclusion**

This project was truly a rich and rewarding opportunity. Overall, there have been two key concluding thoughts from this project: Implementation challenges on a school wide level and, what the TLLP has allowed our school to accomplish.

Implementing a school wide action plan around a common goal of implementing mathematics takes time. It is only because of the dedication of fantastic staff that this

---

6

<https://docs.google.com/presentation/d/1gDtE6nlQSEWLRGhtt4BHZaFLrKuuG4qATnoycCqksaw/present?pli=1&ueb=true&slide=id.p>

project was possible. However, it can be replicated. Through the use of instructional rounds and building honest dialogue among the staff, schools can create an atmosphere that allows teachers to come together in best teaching practices. However, it does take time. This is a factor that we are still working with. As my principal, Cathy Standing, states:

*“It takes three to five years to build a great school. There needs to be honest reflection about what each member wants and brings to the community. As a Staff we need to revisit this always and remind ourselves why we started the process.”*

If any school is thinking of implementing this type of project it is highly recommended that you talk as a lead team, bring it before your school staff and engage in honest talk around a common goal. Include lots of co-planning, co-teaching and co-debriefing among grade levels and staff. The more that educators model collaboration among staff, the greater the chance that collaboration will happen amongst students. Learning is contagious and infectious; as the staff learns and grows so will their students' success.

The TLLP has been one of the best learning experiences that the school community and I have participated in. Without the funding, this type of learning would be hard to accomplish. Teachers need the time to collaborate, co-teach, co-debrief and learn together. It takes time to build trust, capacity and understanding on a school wide level. As more people are involved the more time is needed to accomplish this goal. The TLLP allowed us to accomplish this goal. It gave us meaningful time to spend working together to create a better atmosphere for us as a staff and therefore our students. The best news, our school is continuing the project on our own support this year.

**Resources:**

Chapin, S. H., O'Connor, C., O'Connor, M. C., & Anderson, N. C. (2009). *Classroom discussions:*

*Using math talk to help students learn, Grades K-6.* Math Solutions.

City, E. A., Elmore, R. F., Fiarman, S. E., & Teitel, L. (2009). *Instructional Rounds in Education: A*

*Network Approach to Improving Teaching and Learning.* Harvard Education Press. 8 Story Street First Floor, Cambridge, MA 02138.

City, E. A. (2011). What Are Instructional Rounds?. *Learning*, 69(2).

Fullan, M. (2009). Large-scale reform comes of age. *Journal of Educational Change*, 10(2-3),

101-113.

Fullan, M. (2014). *The Principal: Three Keys to Maximizing Impact.* John Wiley & Sons.

So, Jonathan (2014). *The Impact of Teachers Questions on Students Learning of Part-Whole*

*Relations and a Benchmark Model in Fractions.* Thunder Bay: Lakehead University.

Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008). Orchestrating productive

mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning*, 10(4), 313-340.