

Final Report

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PDIG Project: Integration of the TQE Process in the Elementary Mathematics Classroom

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Project Description

Describe/show to what degree the project was carried out as planned. Include what went well and what proved to be a challenge. Include a synthesis of your journal entries.

The primary goal of our PDIG project was to have dedicated time to work collaboratively as a team of mathematics teachers (Kindergarten to grade 6) in order to develop a common understanding and implementation of the Tasks, Questioning and Evidence (TQE) process in our classrooms. In addition to this, having dedicated time to research and develop tasks and tools supported our mathematics teachers and motivated them to include meaningful tasks to challenge the cognitive abilities of their students. Engaging in dialogue with our cycle teams, as well as our school board mathematics consultant, to share best practices was a valuable and rewarding experience. As well, our team of invested participants in the LCEEQ Math Summer Institute (MSI) was eager to further explore the recommended readings of the Dixon, Nolan and Adams (DNA) team (authors of *Making Sense of Mathematics*) in order to share their knowledge with other mathematics teachers. Our participation in a PDIG the previous year (Collaborative, Conceptual Curriculum) to vertically align our mathematics curriculum encouraged us to move forward to further develop best practices for working with our students and developing their conceptual understanding of number sense.

The primary focus of our PDIG with the TQE process, had been to focus on the conceptual understanding of number sense. However, after delving into our assigned readings from *Making Sense of Mathematics*, our team of MSI teachers agreed that number sense was specifically more appropriate for the Kindergarten and cycle 1 team and cycle 2 and 3 felt that it would be more beneficial to focus on specific concepts that

students typically struggle with and how the TQE process could support addressing those misconceptions.

We anticipated, and feel that we met the objective that the project would increase teacher understanding of the TQE process and how to implement it into the classroom to create meaningful and engaging learning experiences for the students. We feel that teacher participation did allow an opportunity to share our learning from the MSI within our cycle meetings and to develop a common understanding of the TQE process and its importance to support conceptual understanding for students. It has also motivated non-MSI teachers to move forward and try to implement tasks, questions and formative assessment practices for evaluation within their classrooms.

By improving our pedagogical understanding of the TQE process, with a direct emphasis on number sense and conceptual understanding, we are continuing to address our school objective related to early numeracy skills in our newly created educational project (2019-2022).

The format of the project was carried out as planned. MSI team members met three times in a book club format to discuss readings and develop understanding as well as work towards developing appropriate tasks to engage students and challenge their cognition. Cycle teams also met three times to develop their understanding of the TQE process and to work on tasks that they could bring back to their classrooms.

Some of our time was spent on the creation, collection and implementation of tasks, tools and questioning techniques in order for our team to develop an understanding of the TQE process. Formative assessment was regularly discussed as a need as part of the project but was not as thoroughly explored. Establishing a clear vision of student understanding to drive collection of evidence for formative assessment continues to be an area for all team members to work towards implementing.

Journal Entries Synthesis

Over a series of twelve meetings in all, nine of which our team of mathematics teachers from kindergarten to grade six met within their cycles along with the ETSB math consultant Jennifer Hall, to work towards gaining a comprehensive and common understanding of the TQE process. MSI team members met three times specifically to participate in a book club session with the school board's math consultant.

During the book club sessions, members met to discuss their assigned readings, to examine and clarify the common vision of the PDIG project and the implementation of the TQE process in their classrooms. MSI team members used a book club graphic organizer that was designed for this project in order to focus their discussion. Book club participants focused on reporting on results in their classrooms, insights gained through the readings, ties to personal and professional experiences, implications for teaching and learning and reflection and commitment to what ideas they would try upon returning to their classrooms. Much of the insights shared during these book clubs related to how team members were working towards implementation of the TQE process, creating classroom environments and cultures where students are the ones making sense of the mathematics in order to build connections and independently seeking out manipulatives to support their thinking. Our focus as teachers is shifting towards conceptual, rather than procedural learning in order for our students to move away from memorization tricks. We see the importance of understanding that making meaning takes time and that we cannot rush our students but rather need to provide multiple opportunities for them to develop their understanding. More opportunities to use strategies combined with mathematical concepts allows for students to develop a deeper understanding. We also agreed that appropriate tasks that require a higher level of cognitive demand that allow our students to be more engaged and therefore become more powerful learners. The connection between formative assessment and what that looks like integrated in the TQE process was revisited many times in our sessions.

During the MSI team book club sessions, team members also collaborated to build and carry out tasks and tools specific to their grade level. In addition, the mathematical goals and specific learning targets related to the tasks and tools were identified. Many book club sessions focused on the use of effective questioning techniques as related to the formative assessment process to gather student evidence and understand how students are making meaning. Through this discussion the MSI team established a goal within the first meeting to develop a reference document for teachers to model verbal prompts that would elicit student thinking and model a common language when asking questions and providing feedback during the TQE process.

At the beginning of each cycle meeting, team members established their own common goals for the PDIG. These common goals were revisited at each cycle meeting. The mathematics consultant presented history of the DNA team (Making Sense of Mathematics) to give context to the big ideas and from the Math Summer Institute (MSI) and the vision behind the

PDIG. For each cycle, the eight Standards for Mathematical Practice and their connection to the ETSB Math SMART version were presented and defined. The TQE process was defined in the first meeting but revisited subsequently each meeting to reaffirm understanding and to provide opportunity for team members to build their knowledge. The importance of selecting appropriate tasks and questions in order to elicit student response and gather evidence of their understanding as well as misconceptions was reconsidered often as well. As cycle meetings progressed, cycle members were introduced to the learning trajectories for place value, addition and subtraction to numbers to 100 and then 1000 and beyond. The purpose behind these graphic organizers as resource tools was to showcase that mathematics is a developmental process. Cycle teams regularly reviewed and consulted the vertical alignment document that was created in our PDIG last year (Collaborative, Conceptual Curriculum).

Video links from Making Sense of Mathematics were often shared within the cycle meetings in order to clearly show examples of what the TQE process looks like in the classroom. These videos also provided an excellent model of questioning techniques and neutral language to use when supporting students in their sense making.

The importance of exploring mathematics through play was an underlying thread of many of the team meetings as exploration of tasks has a natural connection to exploration of concepts through play. Play also allows for teachers to engage in a natural observation of students and their thinking in order to formatively assess understanding.

Part of each session of each cycle meeting was devoted to working with tasks and tools that could be implemented right away in the classrooms.

By the end of our team meetings it was agreed that we were all feeling more comfortable with our understanding of the TQE process and how to implement it in the classroom. Our team of mathematics teachers embraced the concept and implementation of the TQE process in order to move towards supporting our students' conceptual understandings.

Project Goals

Describe/show to what degree the goals of the approved project were met. If the goals were only partially met or not met at all, describe the reasons for this.

Our first goal of the project was to develop a common understanding

amongst our mathematics teachers that the mastery of numeracy skills is valuable and essential. Through discussion of the students' developmental progress and agreement with our vertically aligned curriculum, mathematics teachers were in agreement. This goal was especially relevant for the Kindergarten and cycle one team as their focus for the project was on all things numeracy. This team realizes the responsibility that they have to ensure that their students have exposure to, and multiple opportunities to engage in meaningful tasks focused on numeracy skills. The K and cycle one sessions focused solely on the concepts of number sense and its relationship to word problems and counting strategies related to addition and subtraction. We as a team feel that this initial goal was met.

In connection to our first goal, we established in the project to address the fact that teachers need to understand how to maximize their teaching time to provide students with opportunities to engage in appropriate tasks to support learning goals related to numeracy. The opportunity to work in collaboration and offer our team of teachers time during our meetings to create and work on tasks allowed us to meet our intended goal. While Kindergarten and cycle one focused on numeracy, this goal was relevant and adapted to the concepts of the other cycles. We were able to provide many tools and tasks that teachers could leave with and implement into their teaching practice and also shared resources to inspire them to further explore on their own.

The second goal, and driving force of the project, was for our mathematics teachers to develop a common understanding of the TQE process. As the TQE was revisited and discussed during each of the twelve meetings that took place for our PDIG project, we feel that this goal was met. What has been partially met is the integration of the TQE process into all of the classrooms. However, this was not one of our goals for the project. Our focus was on collaboration to share knowledge from the LCEEQ MSI and to expose our teachers to the TQE process. It was to promote the importance of the shift from procedural to conceptual learning and how the TQE process allows us as teachers to do that. We feel that our teachers have a common understanding of the TQE process.

After a common understanding of the TQE process was established, we wanted our mathematics teachers to explore the effective use of questions to engage students in mathematical tasks. Questioning and effective use of teacher language was a reoccurring discussion point throughout the project in all cycle meetings. It was explored through the readings of the MSI book club sessions and through the Solution Tree videos presented during the cycle meetings. The videos provided a clear example to our teachers of what effective questioning looks like in the

classroom. It was a primary goal of the MSI team and K and cycle one team, to develop a document to model teacher verbal prompts to elicit student thinking and to model a common language to use when asking questions and providing feedback during the TQE process. This document was created and shared with teachers in the last meetings. As a result of the attention that was paid to this goal and the exploration and development that ensued, we feel that this goal was reached.

The final component of the TQE process is related to collecting student evidence. Our fourth goal was to develop a common understanding of the importance of collecting and using student evidence in accordance with effective formative assessment to understand student learning, clarifying misconceptions and driving instruction. As part of the Commitment to Success Plan's orientations for our school board (ETSB) we are moving towards formative assessment as a priority. This goal was partially met during our meetings. It was discussed and some resources were shared but it was not addressed in a complete way. Formative assessment itself is a new concept for some teachers. Some professional development opportunities have been offered by our school board, but not all teachers attended. Formative assessment by itself will continue to be a goal for our staff to work towards, not just as it is linked to the TQE process. However, pertinent resources and suggestions were shared through the meetings to give our mathematics teachers a starting point.

Our fifth goal was to reinvest and share resources that are research based from the MSI with our team of math teachers. We feel that this goal was fully reached through our project. In each of our book club meetings we discussed and revisited information that we had learned during the Math Summer Institute. We then planned accordingly and shared this information during our cycle meetings. This was an excellent opportunity to bring back to our team what we have learned during the MSI in an in-depth way. Prior to this project, we were only ever able to share a brief overview of what we had learned.

Having the opportunity to work collaboratively with the ETSB math consultant (Jennifer Hall) as related to our sixth goal, was immensely important as she was able to share a multitude of research based resources for our team's consideration. Her knowledge and expertise were essential to supporting our PDIG and provided an opportunity to share best practices and resources with all of our mathematics teachers. Ms. Hall was able to provide our team with reassurance and her effective questioning challenged us to reflect upon our own classroom practices. As a collective team, we feel that this sixth goal was met.

Our final project goal was to maintain a focus on quality math instruction and collaborative communication between cycle members to ensure that our students will succeed and reach their potential. Undoubtedly, our participation in the PDIG allowed for a rare opportunity of dedicated and focused collaboration and communication between cycle members. It is a rare occurrence to have twelve days of dedicated professional development on the same topic in one full year. This process has allowed us to reach our seventh goal. Through our indicators next year as they are embedded within our Educational Project, we will be able to measure if newly integrated teacher understandings and practices as related to early numeracy skills are having an impact on student success.

Our next steps will be to continue to support our teachers to encourage them to continue integrating tasks, effective questioning techniques and varied tools for formative assessment into their teaching practice. We want to ensure that the goals from this PDIG continue to be goals for our mathematics teams and work towards finding common times to collaborate through discussion and sharing of best practices.

Project Outcomes

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

Our first anticipated outcome and achievable teacher gains of the PDIG was that MSI team members would increase their understanding of student progression and mathematical understanding of numeracy concepts and the TQE process and they read and engaged in discussion and one another and the ETSB math consultant regarding chapters in *Making Sense of Mathematics* by Juli K. Dixon et al. in book club sessions. The assigned readings were prioritized by team members and significantly contributed to developing a common understanding. With prior knowledge from participation in the LCEEQ MSI, understanding during reading and discussion was supported.

Secondly, we expected that teachers would carry out one TQE cognitive task after each session to begin the implementation of TQE in the classroom and share their observations, successes and challenges in the following sessions. With the exception of the last meetings (as there was no further follow up opportunity associated with the PDIG) this outcome was achieved each time. This was an important element of the PDIG to ensure that teachers were delving into and increasing their comfort level with the actual implementation of the TQE process. Teacher feedback for observations, successes and challenges demonstrated that this gain was taking place for the duration of our project.

Our MSI team and core group of PDIG teacher leaders, continues to be

invested in the understanding that effective and frequent implementation of the TQE process in the mathematics classroom will support student success and the common objectives of the Ministry of Education (MEES), the Eastern Townships School Board (ETSB) and our school's MESA and future Educational Success Plan. This year we are in transition to our Educational Project and so the goals of our pre-existing MESA are no longer in place. Our Educational Project will now focus on early numeracy skills using an indicator of a locally designed (in collaboration with the ETSB mathematics consultant) common formative assessment tool. This tool will allow us to focus our data collection in a more formative way and administer it twice during the school year to allow teachers the opportunity to identify student understanding, misconceptions and drive instruction. This data will be recorded and presented in the next year's Educational Project report (replacing our MESA).

Our final projected outcome was that the TQE tasks (one per cycle) would be collected and made available for future classroom use after each of the sessions. Each of our MSI team members were responsible for the collection of the TQE tasks and tools that were shared during our cycle meeting sessions. These tasks will be organized in hard copies and available in a central location in our school. Digital documents will be shared in a folder on our school Google drive.

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. If applicable, comment on whether or not this project should be carried out by other teams and if so, how it could be improved.

Our team's participation in the LCEEQ MSI inspired us to move forward to further explore the developmental learning trajectories for number sense and operations and the implementation of the TQE process in our classrooms. Our previous involvement with the vertical alignment of our school's curriculum encouraged us to pursue further opportunities to collaborate with our team of mathematics teachers and develop common understanding. With the expertise and support of our ETSB mathematics consultant we were able to realize our project from the theoretical to the application phase.

The learning achieved by the participants in our PDIG has been significant. As all participants were active learners, participating in carrying out and creating tasks and tools they were able to apply and better understand the learning targets of this project. The way in which the sessions were organized and implemented received a great deal of positive feedback from our participants and engaged them and motivated them to take their resources back to their own classrooms.

Team members have developed a common understanding of the TQE process and its importance in supporting student conceptual understanding.

As many schools in Quebec participated in the LCEEQ MSI, participating in a project similar to our PDIG would allow other schools to reinvest and share resources with their team of mathematics teachers. Involvement would support the strategic goals of the LCEEQ to support professional development and delivery of educational resources and support within schools. Opportunities to collaborate and share best practices related to research based information mobilizes people and resources.

The TQE's connection to formative assessment in the mathematics classroom is a critical component for the educational community at large. We are witnessing a shift in classrooms towards the priority of formative assessment and multiple ways to gather student evidence and this project leads towards those goals. Should this project be carried out by other teams we would suggest a dedicated day for each team to focus on formative assessment in the mathematics classroom. Each component of the TQE process is significant and equal time devoted would help to support further understanding.

Should other teams carry out this project, we would also suggest that the book club portion involve non-MSI participants as well. Perhaps not at the same time, as their level of understanding was not the same as MSI team members who arrived with prior knowledge. We strongly value the knowledge that we have acquired through the MSI opportunity and through our readings from the *Making Sense of Mathematics* by Juli K. Dixon et al. Our team is fully aware that it is difficult for teachers to make time for professional readings. The book club sessions motivated us to focus on the readings of *Making Sense of Mathematics* by Juli K. Dixon et al. and other researched based resources suggested by our ETSB mathematics consultant. This would be a valuable opportunity for other team members to participate in as well.

Participation in this PDIG has been exceptionally rewarding. It provided our mathematics team with the opportunity to collaborate and develop a common understanding and vision for our mathematics curriculum within our school. Our understanding of not only the components of the TQE process, but also Standards for Mathematical practices and learning trajectories, has increased and inspired implementation of these fundamental practices in our classrooms. This PDIG has been the second

step in our goal of influencing and impacting quality mathematics teaching instruction and practices as well as collaborative communication within cycle teams. The end result of these efforts will be to support students and ensure success in mathematical understanding.