

**PDIG PD13880: Understanding the TQE process in Secondary 2**  
**Final Report**

**Project Description:** The project ended up being carried out differently as intended (reasoning explained in the next section) however, it was very productive. Working as a grade level team with our consultant, we quickly realized that the common understanding that we thought we had with respect to the program content and the expected level of difficulty was in actuality NOT so common. Through this work, we were able to establish common expectations for our students and it has created a situation in which students are accessing the same curriculum in each of the classes. Working as a whole team to determine essential learnings, rigor, and level of difficulty has brought the team to a new level of collaboration. It was very useful and appreciated to have our consultant, Cheryl Cantin, work with us through the project and provide professional development to the team as we moved forward. What proved to be a challenge was that we were not able to fully implement our proposal of creating tasks, and then analyzing student data to look at evidence of student learning. We leveraged the creation of common summative assessments to act as a springboard for discussions on essential learnings, level of difficulty and expected rigour. Because of the thoughtful design of the questions on the summative assessments we were able to use a “item analysis” of student responses to gather evidence of student learning and students requiring further support to master the concepts. Ideally we would have been able to create tasks to use in the formative assessment process as per the TQE process but it was clear that foundational elements were missing before we could proceed to that piece. Now that we have established these foundational elements it is our goal for the 2018-2019 school year to continue working with our consultants on identifying our learning targets and finding tasks that match our goals.

Below is a synthesis of our Six Days:

DAY 1: Focus: Curriculum Map and TQE process

Our team talked about the overall goal of the project. We spent time looking at the TQE process and the fundamental first step of getting common expectations and terminology as a team.

In order for us to understand the TQE process, we had our Math Consultant, Cheryl Cantin, go through with us (1) the characteristics of Mathematically Rich Tasks and (2)

Hess' Cognitive Rigor Matrix in order that we could have a common understanding of the type of tasks we are aiming for.

After this, we spent a good part of the day looking at our existing curriculum map, discussing and modifying the order based on student need and logical progression of topics.

#### DAY 2: Focus: Algebra and Equations

The focus of this day was to look at our Algebra and Equations Unit. We started talking about tasks and quickly realized that we needed to backtrack and outline our essential learnings for the topic. We spent the morning creating our essential learnings from our current curriculum map and the QEP, discussing and negotiating level of difficulty, rigor and teaching approaches. Cheryl Cantin discussed with the team the importance of building conceptual knowledge before procedural fluency. In relation to Algebra, the idea of building concrete models using algebra tiles was discussed and modelled. Finally, the team made up a common assessment based on the essentials. The creation of the assessment was based on the template used in grade 9. The questions are structured in a way that student errors will elicit the most common misconceptions that students make. Creating this following our essentials allowed us to discuss student misconceptions and teaching strategies and tasks to help students create alternate conceptions.

#### Day 3: Focus: Rates, Ratios and Proportions

The day started with our consultant providing background on the learning and the common misunderstanding in rates, ratios and proportions. The team created a pre assessment that could be used to assess misunderstandings before beginning to teach the unit. The team discussed the learning trajectory and the expected outcomes (level of difficulty) for the Grade 8 program. In this process, we noticed a significant discrepancy in what we were "teaching" and what the expectations of the program are. It was in this session that we realized that creating common summative assessment permitted the team to have discussions related to a) what an appropriate level difficulty would look like with respect to the program and b) provide reliable data that could be used to signal "at risk" students for intervention. The discussions around student responses to the summative assessment questions lead us to discuss what evidence of student understanding would look like (the E in the TQE process).

#### DAY 4: Focus: Linear Relations

The day started with a discussion of the expectations of the program and how what we were doing match, or in our case, did not match the curriculum of the learning trajectory for this content. In particular, our team heavily emphasized the slope-intercept equation for a linear relation ( $y = ax + b$ ) as well as the slope formula ( $a = (y_2 - y_1) / (x_2 - x_1)$ ). In looking at the progression of learning as well as the learning trajectory in the Making Sense of Mathematics for Teaching 6-8 book, we realized that the slope-intercept equation for a linear relation is a Grade 9 topic and the slope formula is a Grade 10 topic. The team discussed how to adjust our expectations to meet the students at a developmentally appropriate level (unit rate & initial value.) Once again, the creation of a common summative assessment allowed us to come to a common understanding of what evidence of learning at an appropriate level would look like.

We realized that an area that the team felt less comfortable teaching was getting a rule from a pattern. In the afternoon, our consultant modelled a sample lesson with the team to allow us to see how the importance of sense making in generating rules for geometric patterns. Team members shared how we came up with a rule much like students would do. This allowed us to appreciate the various thinking paths to an answer and also allowed us to get a better idea of how this type of discussion may play out in our classes. This opened the door to more of an openness to accepting multiple student strategies.

DAY 5: Focus: Circles: Circumference, Arc, Area & Sector

A big discussion among our group on this day was the conceptual understanding the relationship between radius/diameter and circumference ( $\pi$ ) and the relationship between radius and area ( $\pi$ ). Another important discussion was the importance of students being able to manipulate a single formula versus having permutations of formulas on the memory-aids, that, in some cases, confused students more. In looking at past assessments for this unit, we realized how they contained redundant questions that penalized students that did not understand. Again, we focused on building a common assessment that would be a) at an appropriate level of difficulty and b) provided information for intervention. We were careful to watch for redundancy that would penalize students as this was a weakness in our previous assessments.

## DAY 6: Focus: Surface Area and Probability

This was a loaded day as we discussed two units in the program on the same day. One significant discussion was the meaning of the total surface area and lateral area and how students can gain a conceptual understanding of what these formulas represent. A discussion was had about the value of the standard formula ( $TA = LA + 2b$ ) versus looking at the total area from the perspective of the shapes' net. We also discussed how the bases of composite solids cause a significant problem for students and how to address this misunderstanding (removal of two bases.)

The team discussed our use of "apothem" and "slant height" in composite figure because the term apothem can be used in several contexts. The team agreed that the word "apothem" must be presented to students but that slant height would be provided in parentheses for clarification.

We also discussed the various language used in probability and statistics and came up with common definitions to share with students.

Lastly, we focused on building a common assessment for surface area that would be a) at an appropriate level of difficulty and b) provide information for intervention. We started a common assessment for Probability and Statistics which we will complete during team planning time.

**Project Goals:** The main goals of this project were to share professional readings, engage in professional development as a team, create tasks for conceptual teaching, and look at evidence of student learning.

In starting our work together, we had our consultant do some professional development with us on the TQE process, the characteristics of mathematically rich tasks, and Hess' Cognitive Rigor Matrix in order that we could have a common understanding of the type of tasks we were aiming for. In moving forward and trying to create tasks, we quickly realized that our goal for the project would need to be modified because it was not productive to create tasks when we did not have agreed upon curriculum with a common understanding of our expectations of students. We had a curriculum map outlining the order of the units and timing, but NOT detailing the expected level of difficulty or the essential learnings from each unit. Thus for each day we met we kept the original teaching concept as in the proposal but started each session going back to the QEP and our curriculum map to negotiate level of difficulty, rigor, and teaching

approaches. We also created a common assessment, structuring questions to elicit common errors and misunderstandings. Following the creation of our essentials list and common assessment, we were able to discuss misconceptions and teaching strategies and tasks to help students create alternate conceptions.

### **Project Outcomes:**

The outcomes for this project is that the entire grade level team now has a common understanding of our curriculum map, the order of topics, the essential learnings within each topic. We also have common assessments which were created to elicit student errors and provide us with reliable data to target interventions with our students. Although we did not fully meet the original goals of the proposed project, we made a lot of progress as a team and have begun to create a professional learning community. Our next steps as a Grade 8 team is to create common marking guides, particularly for the application questions on our assessments. This will help us solidify our common understanding of grade level expectations. We will also be having a common marking session with the entire Math team in June for the board mandated summative exam. This will help the other grade levels understand the expectations of our program. In the 2018-2019 school year we would like to start to carefully consider the mathematical goals of our lessons and consider what evidence of student learning “looks likes” DURING the learning process and then selecting appropriate tasks with those learning goals in mind.

### **Reinvestment:**

The process that our team went through during this project (creating a curriculum map that follows the QEP, agreeing on essential learnings and on level of difficulty respecting students’ developmental readiness) is an essential first step in creating a professional learning community that will benefit all the students in our grade level. Working as a team to create a more uniform learning experience for our students in Grade 8 (Secondary Cycle 1, year 2) is essential in creating a solid base of mathematical knowledge that will help students be successful moving forward into grade 9 and 10. In addition, because the assessments are designed to elicit particular evidence of student learning, or non-learning as the case may be, we have been able to carefully consider how to support the struggling learners to improve overall readiness for Grade 9. Our teams have now done this similar process with grade 8 to 10. The resources created and learning achieved will be beneficial to the team moving forward

and will also be helpful to any new members of the team as the curriculum is established and clear.

Moving forward, it is important to remember that when trying to initiate change, it is important to remember that each individual moves at their own pace and that change is difficult to negotiate and maintain. It is important to have manageable goals so that the team can experience success.