

Final Report: Developing Sound Instructional Approaches for Teaching & Learning Situational Problems at the Middle School Level

1. Project Description

Our middle school math team's purpose in undertaking this project was to develop sound instructional approaches with regards to the teaching and learning of situational problems in mathematics at the middle school level. In retrospect, we now know that this was indeed a lofty expectation. Developing instructional approaches in any subject area takes years of research, in-class experimentation, on-going discussion with colleagues and deeply reflective practice. To expect that we would spend five days out of the school year together and experience a monumental mind-set shift that would in turn manifest fail-safe instructional approaches for teaching math, was (we now realize!) doomed to fail.

To say that we learned nothing during our days together as a team of dedicated teachers would be a gross injustice to what actually occurred throughout the duration of this project, however. Each teacher involved in the process recounted that now that they had delved into developing a meaningful framework by which our students could navigate problem solving, there is no going back. Our eyes have been opened and we now know that the seeds of developing sound instructional approaches can only be planted when we as teachers can agree on one thing: what we want our students to learn, in its most specific terms.

With that in mind, we first agreed that one of the soundest ways students could begin to build their own meaning out of any mathematical problem was through talk. Developmentally, teenagers need to use talk to make sense of any situation in their lives – the same goes for problem solving in math. We created some grade appropriate word problems and a planning sheet that we could use to model using talk to formulate a plan when faced with any math problem, as well as a rubric by which we could evaluate the record of their thinking (see attached documents). All teachers involved in the project piloted the modelling of using talk to build meaning when approaching word problems in their classrooms, with varying degrees of success. What this led us to determine was that students needed repeated exposure to this type of situation before a meaningful assessment of their progress could be made.

After reading an excerpt from *Simplifying Response to Intervention* by Austin Buffum and discussing its implications, the bulk of our work for the remainder of the project sessions lay in creating an Essential Standards Chart for the grade 8 curriculum, creating situational problems and learning situations for both grade levels that aligned with our new understandings of what rigor should look like at each explicit stage of learning math and developing a plan with our school's administration that would help support all students in math, in terms of class composition.

2. Project Goals

We are proud to report that our ability to meet each of our projected goals were, to varying degrees, met for this project. Perhaps not in the way that we had envisioned their fruition, but they were met!

To begin with, we wanted students to be able to deconstruct strategies and methods required to solve a situational problem. Teachers described that some students were using the planning sheet we had created reliably and that when the sheet was not provided, students would attempt to recreate the same structure so that they could figure out how to approach the problem. Students were using the planning sheet in a variety of contexts; on tests, in class group work and at times, in their homework. It was validating to see that some students found the planning sheet useful in approaching a task. In this way, it can be said that students used this planning method the teachers had provided them with as a scaffold to help solve math problems.

Secondly, we wanted to determine strategies to be taught per term throughout Cycle 1 Secondary Mathematics. Here we did not meet our goal in its entirety. We did succeed in determining that the most fundamental strategy that students needed to use on an ongoing basis was to talk through & discuss their problem solving approach with their peers. Each of the teachers increased the amount of time students spent discussing the problems presented to them before solving them and informed the group that this simple allowance seemed to help performance in the class as a whole. Teachers also began to organize their lessons by keeping talk as a guiding feature in their planning, specifically, teachers created math stations, which encouraged students to use talk to determine how they were going to approach the given math problem(s). By all accounts, students were highly engaged during these math stations. All teachers agreed that they would begin modeling and using the word problem planning sheet as early as possible at the onset of the school year & throughout it, which could be considered as meeting our goal in this area. What we were not able to do was break down which strategies to implement by term. Discussion of this among the team made us realize that sticking to a strict timeline regarding when to teach which strategy can be challenging: we have to consider that each class develops at a different rate and we need to be sensitive to the fact that only the teacher knows when students are ready to progress, not the calendar.

Third, we wanted to allow teachers to adapt / create situational problems to support the teaching strategies that we had amassed throughout the project. Although we did not develop instructional strategies as we had hoped, we did create several situational problems and learning situations that supported the ideologies that we had read about in *Simplifying Response to Intervention*. This process allowed all teachers to sharpen their focus in terms of the word choice they used in the assessment task, as well as how to assess what we really wanted to see from the students.

Our last goal was to allow teachers to align strategies from the beginning of grade 7 to the end of grade 8. As a team we feel that the creation of the Essential Standards Chart helped push us in this direction. It allowed us to specifically outline what rigor looks like for each concept and in so doing, create explicit learning expectations for our students to help measure their growth on a continuum.

In all honesty, our team believes that the reason we did not meet all of our goals is that as we began to work, we realized that before we could go about developing

instructional strategies, we had to agree on what it was we wanted our students to know. If we didn't know that, then we would be working blindly. Also, we knew that the time we had spent in our sessions clarifying what rigor looked like had *already* begun to shape our practice throughout this school year, so the potential for it to shape our instructional practice in the upcoming school years cannot be understated.

We feel very positive about what we were able to achieve but we know it requires further investigation, which is why we plan to continue exploring how best we can support our students' success in mathematics in the future.

3. Project Outcomes

We felt that the best way to describe the gains the participating teachers achieved throughout the project was for them to contribute testimonials. Responses have been synthesized and annotated for brevity.

"Throughout the PDIG I have gained concrete knowledge on how to assess students' knowledge without using rubrics or formal evaluations, but rather through talk and through discussion of their ideas. I have listened more than ever to their ideas rather than by looking at right versus wrong answers on paper. I have also explored new ideas to make math more engaging like creating stations that implement different strategies and get students moving. The most significant piece I have taken away from this PDIG is that math should be a process of exploration and development, and that at the end of the day the student can never cease to learn a topic but can continue to evolve with it. Finally, the discussions had with colleagues and consultants throughout this PDIG have been beyond enriching and motivating to learn more, accept more and develop more as an educator."

"Having the opportunity to discuss teaching practices with veteran teachers was very practical. I learned a lot about short term and long term range plans and the importance of staying on track (time management skills). Teaching in a specific progression and introducing material in a certain way so that students have the best odds of achieving success was another area I learned a great deal about."

"Having the opportunity to speak with colleagues and gain resources (and create them) is a fantastic way to better our teaching practices. This year the only reason I survived was because I had many resources that other teachers shared with me that made my job easier!"

"By having the time and freedom to examine our curriculum we were able to create activities and documents that we could use directly in our upcoming lessons. This means that instead of just *talking* about how we wanted to adjust our teaching, we were actually able to do it."

“This grant was a phenomenal way for me to prepare myself to teach my students various concepts, breaking down the information to better present concepts to them. Additionally, the opportunity to listen to other colleagues and their methods was also a great tool to better my teaching.”

“This PDIG grant allowed for fruitful discussion with my colleagues, which encouraged me to think outside the box as a Math teacher. It gave us the time to tackle some approaches, and concretely make changes to the "teaching" of certain concepts that lead to a clearer understanding for students. This time also reminded me that as teachers, we need to be patient with ourselves and our students, and remember that change takes time but repetition is key to success.”

4. Reinvestment

Like the best learning in life, our efforts and mind set shifts throughout this project have already begun to affect our teaching practice. To date, we have shared our new ideas at our math department meetings, to much interest from our colleagues in senior school, who are now considering how they might undertake a similar project in nature. It has prompted two of our school’s math teachers to register for the Summer Math Institute offered by LCEEQ.

Our team would be more than happy to share our experience, trials and all, with any other math departments at other schools. This could be done by means of holding a workshop where representatives of math departments from across the province could attend, or through setting up an online forum whereby math teachers could discuss how to approach a similar project. Other schools throughout the province could then use the lesson plans and assessment tools that we have created in their own classrooms and experiment with them. We would of course be open to other suggestions for sharing resources with peers and are more than willing to accept critique on the documents we created throughout the project.

As a team, we are convinced that this type of project – shifting from the “heads down & teach” approach to “eyes open & adapt” approach – is highly valuable for any & all math departments in the province.