

## **PDIG Final Report 2020-2021**

### **Sec. 5 Rich-Tasks and Interactive Workbook**

*Prepared by James Gore (Sir Wilfrid Laurier School Board)*

#### **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.*

Our goal was to create a series of rich tasks for Sec. 5 CST secondary mathematics within an interactive workbook. The purpose behind this goal was to have a shared bank of resources for teachers to use and model for their own creation purposes. Additionally, we wanted to provide teachers with an effortless way to electronically distribute the tasks to their students.

Although the interactive workbook presented a challenge, we were able to create the following rich tasks:

<b>Tool Title</b>	<b>Topics Covered</b>
Ice Cream Headache	Voting Methods
Polygon of Constraints	Optimization
The Circus	Graph Theory
Golf Balls	Equivalence
Fair Game	Probability
Financial Math Task	Financial Mathematics

Each tool has a guide on how to use them with students and rubrics for assessment. There is also a brief guide for teachers to use if they would like to develop their own tools as well as generic rubrics with ideas on how to modify them to fit their projects.

There were some initial struggles with the project. Because what defines a rich task is broad in scope, the team had trouble producing a common conception of what we were trying to accomplish. During our third meeting, we met with Zak Likely from ESSB and re-visited what constitutes a rich task. After the meeting, the team members felt better equipped to work on our project and we were able to produce content for each major topic in the course.

Because of the pandemic and hybrid teaching, it was exceedingly difficult to find days for the teachers to be able to work together. In the end, most of our meetings only involved myself and either one or two teachers. For the development of the projects, it

worked well enough. However, it limited our ability to share ideas in real-time with each other and properly address each other's feedback.

Despite that issue, most of the rich tasks that were developed were field tested and adjustments were made where necessary.

### **Journal Reports and Class Demo Sessions**

#### **Meeting #1 – October 28, 2020**

*Members Present: Helene Damoulianos, Francesca Fuoco, James Gore, Heather Usher*

For our initial meeting, we reviewed what rich-task activities are supposed to look like. We split up the tasks and began work on developing rich-task activities. At the end of the day, we quickly reviewed what we had done and what we would be doing next.

#### **Meeting #2 – January 27, 2021**

*Members Present: Francesca Fuoco, James Gore, Heather Usher*

For this meeting, we were joined by Zak Likely (of ESSB). We went over what a rich-task should look like as there were a few ideas put forward that looked less like a rich-task and more like standard application questions that are typical of what you would see on the final exam. After we were back on track, we worked separately and returned during the final hour to review our progress. We were able to develop a few new tasks and refine the few that had been developed so that they matched the criteria of what a rich task should look like.

#### **Meeting #3 – February 18, 2021**

*Members Present: Helene Damoulianos, Francesca Fuoco, James Gore, Heather Usher*

For our third meeting, Zak Likely (from ESSB) joined us in the morning. Since the focus of our earlier two meetings had been mostly about the development of rich-task activities, this meeting began around a discussion concerning the interactive workbook part of this project. We're looking at ways to create an open-source document that teachers can easily use depending regardless of if they're using Google or Microsoft (or something else) as their LMS. We're going to experiment using Adobe InDesign to create the tools and create interactive PDFs so the activities can be showcased and integrated into whatever a teacher is using. After that, we recapped what we've done so far and continued work on the rich tasks that still needed some work. The plan for next session will be to test drive the rich tasks that we've already created and make adjustments where needed.

#### Meetings #5 – October 22, 2021

*Members Present: Helene Damoulianos, James Gore*

Helene and I met to go over the work that already had been done for the project and to discuss what was left to do for her projects. We produced a plan for development and a strategy on conducting one of these tasks in her class.

#### Class Demo Session – October 29, 2021

*Members Present: James Gore, Heather Usher*

Heather introduced her activity *Polygon of Constraints* to her students. The purpose of the task is to create a polygon of constraints that tell a story (for example, one student built a rocket ship out of a polygon on a Cartesian plane). The activity worked really well as the students who excel in the class were trying to work with as many half-planes as possible while the students who typically struggle were still able to create a polygon without much difficulty.

#### Meetings #5 – November 5, 2021

*Members Present: Helene Damoulianos, James Gore*

Helene and I met online to continue work on the project. Helene worked on the projects that she would be doing in class while I continued to develop the interactive workbook.

#### Meeting #6 – November 17, 2021

*Members Present: Helene Damoulianos, James Gore*

Helene spent the day finalizing her projects to get ready for her to try in class. We discussed *The Circus* task that she was planning to use and discussing strategies on how to approach the class considering that she will not be trying this task with a group of students that are not her own.

#### Class Demo Session – November 19, 2021

*Members Present: Helene Damoulianos, James Gore*

*NOTE: I was only able to attend the end of class, so this summary is based on what Helene reported.*

Helene gave the students *The Circus*, a rich task centered around the topic of graph theory. The students were into it as they were able to move around and look at mathematical logic in a different way than they've been used to. Although some of the students felt a little lost and needed direction. There were a few students who were not participating, but that was because these students typically don't do their work in class; it wasn't because of the task itself.

## **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 main goal of developing rich tasks for the major topics of the Sec. 5 CST course was achieved. Several of them were field tested (*The Circus and Polygon of Constraints*) while others had been modified versions of tasks that teachers had previously used (*Fair Game* and *Golf Balls*).

The other major component of our project, creating an interactive workbook, was not met although instructions for integrating each task into a Microsoft OneNote class notebook or a Google Classroom group are provided with each task.

Although not being able to meet consistently and regularly as a group did contribute to the interactive workbook becoming less of a priority, the greater issue is that trying to produce a way for the files to be accessible using interactive tools proved to be too cumbersome.

The major issue is that some boards support only Microsoft products while others support Google. Even in boards where both are supported, there is a split between and within schools on which software to use. At this point in time, there's no way to easily convert Microsoft OneNote material into something that Google Classroom can use. Google Forms can't be converted to Microsoft Forms. The two platforms are incompatible. We would have had to design the workbook twice.

I had tried to use other tools to try and split the difference. For example, I experimented with using Adobe InDesign to create interactive PDF documents that could be uploaded into Google Classroom and Microsoft OneNote. However, there were limitations on what InDesign could do with the PDF format and while it can do some remarkable things with desktop publishing, it just couldn't do what was needed for the project.

We also tried to hold a workshop with teachers to discuss rich-tasks and show the work that we had done with our teachers. The workshop was scheduled in May but had to be cancelled because of low registration. The response from teachers was that they were busy trying to prepare for end-of-year assessments since exams were not being provided for June and that they didn't have time to attend (several teachers flat out asked if I can cancel the workshop to help them develop exams).

## **Project Outcomes**

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

During this project, the teachers got a better sense of what a rich task is and how to produce them. Given more time, it's quite possible that the teachers would have been able to create double the number of tasks in the same amount of time.

The biggest issue we have with any non-traditional activity in mathematics education—especially secondary—is this stigma that anything alternative or outside-of-the-box is difficult to create and use as an assessment tool. For the teachers involved, this barrier hasn't been completely knocked down, but they feel more comfortable incorporating these activities now more than did before.

As mentioned earlier, another gain is a vital resource for the Sec. 5 CST program. Not to say that what we've created is beyond words, but because there is so little that is shared for this course, the creation of any type of resource is always well received.

### **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.*

The National Council of Teachers of Mathematics promote eight high-leverage instructional practices. One of these practices is for teachers to implement tasks that promote reasoning and problem solving. Another is to facilitate meaningful mathematical discourse. With rich-tasks, we're hoping to give students challenging tasks that require out-of-the-box thinking and not rely on routine to solve the problem.

Because these tasks are designed to be done before formal teaching of concepts, they can be used as a way of gauging student readiness to be able to handle the topic and if they require revisiting concepts taught previously before they can continue. They also serve as low-floor/high-ceiling tasks that are approachable to all. So even if there are students that are below level, they still will be able to work with the task and feel a sense of achievement. This way, they won't feel discouraged even if the teacher must revisit concepts to bring their level of understanding up to where they need to be to continue with the course.

A major issue for Sec. 5 CST teachers in Québec is the lack of resources for their course. Because the course is quite unique compared to grade 11/12 courses offered in other provinces or the United States, there isn't a lot of material out there for topics like graph theory or financial mathematics. Even products that are advertised as being as "aligned" with the Québec curriculum fall short as most of these services come from outside the province and only repackage their existing material to fit within the parameters of the QEP and PoLs for Sec. 5 CST. Except for the textbook, workbook, and a couple of pay-service websites, there is little material to support Sec. 5 CST teachers; and even that of what exists is more traditional than what we're focusing on with rich-tasks.

Initiatives like the Math Summer Institute are already underway that promote the use of rich tasks. This project was created with the Math Summer Institute in mind to give teachers who have been part of the program something that they can use in their

classroom (two of the teachers that were part of this project have already attended the Math Summer Institute). To continue to encourage a shift in practice from routine problem solving to agile thinking through rich tasks, it's important projects like this exist to not only support initiatives like the Math Summer Institute but also to encourage teachers to try these types of activities in their classroom.

If we were to do this PDIG again, we would try to make sure that we focused less on developing as many tasks as we can and narrowing our development so that we can field test them together, gather feedback, and make adjustments. Also, it would be beneficial to go into the classrooms of teachers who have yet to participate in the Math Summer Institute and/or don't use rich tasks to show them what's possible and sell them on the benefits of shifting their approach would be to student success.