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Mapping Student-Directed STEM Inquiry onto the Quebec Education Program: A School-University Research Partnership

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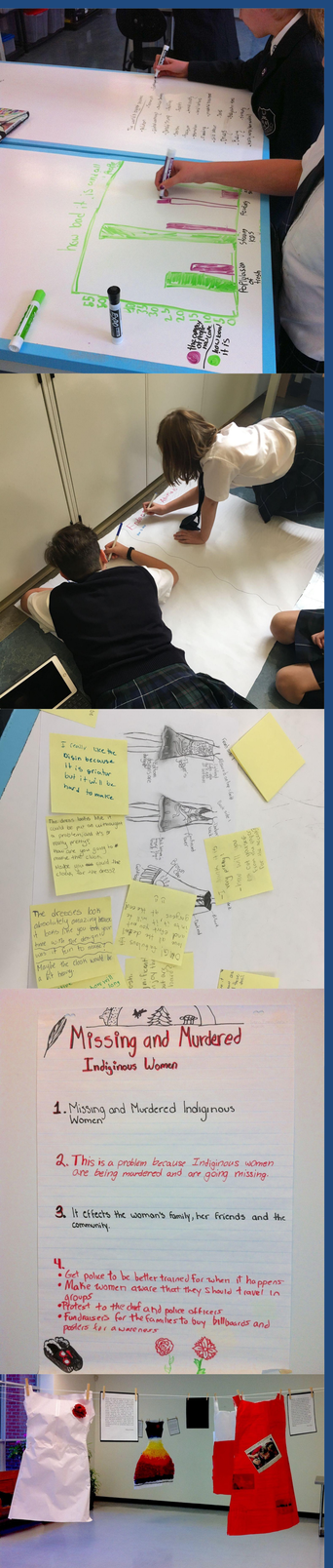

Research Question: How does student-directed STEM inquiry align with the Quebec Education Program?

CONTEXT

- Inquiry-based STEM learning leads to improved conceptual understandings, retention, and skills for students [1,2]
- Teachers struggle with student-directed STEM inquiry due to perceived barriers such as: lack of time, resources, professional development, support from school admin [3,4]
- Teachers also worry student-directed inquiry will lack clear curricular connections [5,6,7]

Goals of this study

- Analyze 2 years of student-directed STEM inquiry from a Grade 7 Science and Technology course at a small, independent school in a large Québec city. (The second year included a pandemic pivot)
- Map the STEM inquiry against the QEP [8] to determine if and how the inquiry aligns with requirements of the program

FRAMING & METHODS

Framing for study

- QEP Cycle 1 Program [8]
- Focus on teaching and learning instances related to:
  - 6 Broad Areas of Learning
  - 9 Cross-Curricular Competencies
  - 3 Disciplinary Competencies and Progressions of Learning (content) in each disciplinary area: Science & Tech, English Language Arts (ELA), Math, Social Studies, Art, Personal Development

Data sources

- Audio & video, lesson plans, photographs, student work (exit tickets, projects, notes) from 18 classes (Year 1), and 28 classes (Year 2)
- Interviews with teachers and students

Methods

- Individual classes were analyzed for links to Broad Areas of Learning, Cross-Curricular Competencies, Progressions of Learning, and the Disciplinary Competencies across the program
- Classes were split amongst research assistants, analyzed for links to the QEP. Curricular links were then checked by another research assistant
- Counts for each element of QEP were tabulated and totaled

RESULTS

	Year 1	Year 2 (Pandemic pivot)
Topic chosen by students	• Missing & Murdered Indigenous Women	• Fast fashion
Broad Areas of Learning	• Citizenship and community life	• Citizenship and community life • Environmental awareness & consumer rights & responsibilities
Cross-Curricular Competencies	• All touched on • Top 3: ○ Uses creativity (65% of classes) ○ Cooperates w/others (59% of classes) ○ Solves problems (47% of classes)	• All touched on • Top 3: ○ Communicates appr'ly (54% of classes) ○ Uses creativity (54% of classes) ○ Uses information (46% of classes)
Science & Technology	• All competencies addressed • POLs focus on skills, scientific communication, strength & behaviour of materials, design processes	• All competencies addressed • POLs heavy on materials, manufacturing, pollution, scientific communication, problem definition and solving, skills
Both years very quickly became interdisciplinary. See figures below.		

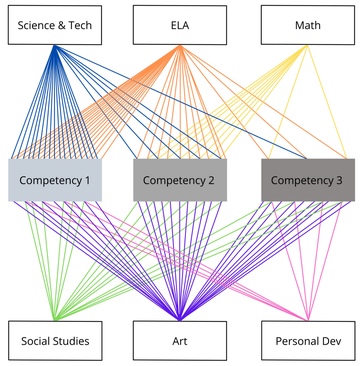

Figure 1. Number of times the competencies for each subject area was addressed in Year 1 of the project.

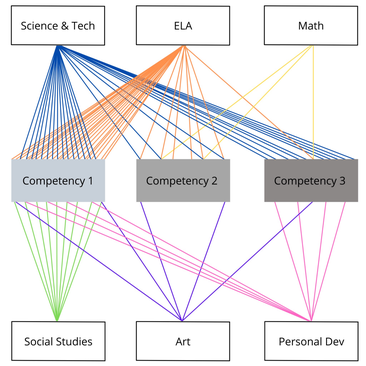

Figure 2. Number of times the competencies for each subject area was addressed in Year 2 of the project.

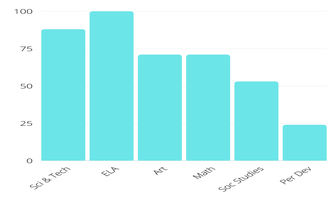

Figure 3. Percentage of classes where PoLs for each disciplinary area arose in Year 1.

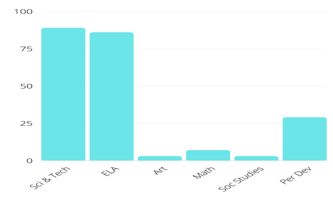

Figure 4. Percentage of classes where PoLs for each disciplinary area arose in Year 2.

DISCUSSION

- Curricular connections are clear and interdisciplinary
- Prevalence of ELA with Science & Tech is indicative of the strong role scientific discourse plays in the QEP [8]
- In Year 2 the strong showing of Science & Tech Competency 3, which focuses on language, is related to the pandemic pivot and a shift to a more talk-based project

"I know this type of learning is risky but the benefits far outweigh the risks. Benefits like fostering curiosity, giving students agency in their learning, learning to fail forward, and valuing process over product."
Partner School Teacher