

Background

Students

Enhancing student knowledge, skills, and motivation by applying knowledge from different subjects to solving real-life problems.

Improve conceptual understanding through the application of knowledge in real-life situations (Putica & Trivić, 2017)

Develop teamwork & various skills such as organization, project management & communication (Costa et al., 2019)

Increase engagement in learning through enhanced confidence, satisfaction, and achievement (Everingham et al., 2017)

Benefits

Interdisciplinary Teaching & Learning (ITL)

A teaching and learning approach allowing students to integrate theories, concepts, perspectives, and methods from two or more fields in order to solve real-life problems (Helmane & Briška, 2017).

Challenges

Teachers

Curriculum challenges in - aligning interdisciplinary plan to district standard
- combining different subjects

Structural challenges in - scheduling interdisciplinary lessons / controlling the sequence of instruction of each subject

Pedagogical challenges in - establishing a classroom environment for ITL
- meeting the diverse needs

* Secondary school teachers, who are typically subject specialists, often feel unprepared to implement ITL in their classrooms (Shernoff et al., 2017)

Perspectives

Interdisciplinary collaboration

Collaboration between teachers from different subject areas

This type of teacher collaboration can create synergies by leveraging different viewpoints, strengths, and weaknesses
- by having common planning time to connect learning content
- by taking on roles that enhance their strengths (Wang et al., 2020)

Conceptual Framework for Interdisciplinary Collaboration: PLCs

Professional Learning Communities (PLCs)

Groups of individuals (teachers) who work together on a regular basis to enhance their ability to meet the educational requirements of their learners by sharing a vision focused on the curriculum (Reichstetter, 2006).

Within PLCs, collective teacher learning through sharing and reciprocal feedback (DuFour, 2004)

→ Improves teaching effectiveness (Graham, 2007), Changes teachers' beliefs and practices (Tam, 2015), and Increases collective efficacy (Voelkel & Chrispeels, 2017)

Research Question

This study investigates the impact of interdisciplinary teacher collaboration within one school-based PLC, on secondary school teachers' teaching practice.

Research Question

"How can a PLC support STE(A)M teachers seeking to implement interdisciplinary teaching into their practice?"

Research Context

The study took place as part of a research-practice partnership between McGill University, Bishop's University, and a small independent school in Québec.

Specifically, the four goals of the partnership are:

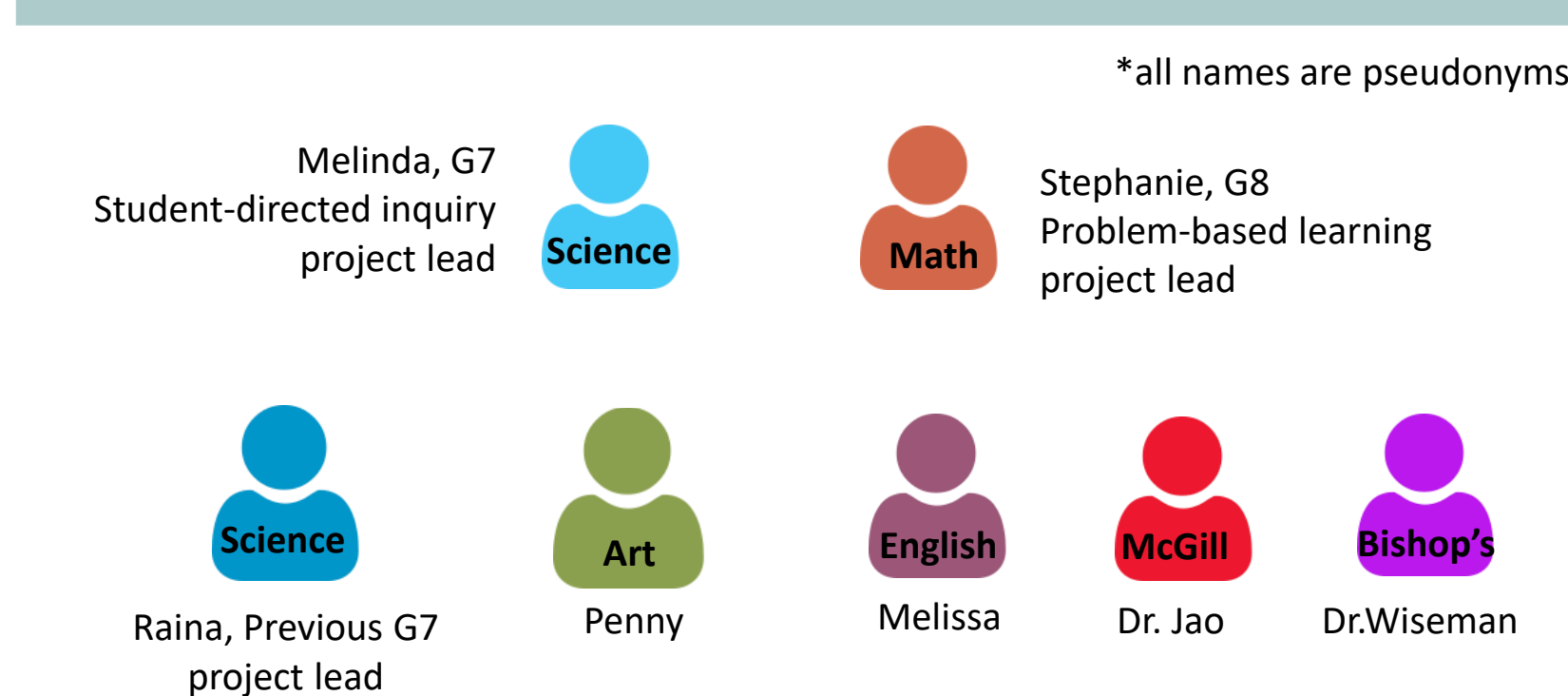
1. To support teachers in implementing student-centered and -directed teaching and learning;
2. To support teachers in building community through teacher collaboration, within and across disciplines;
3. To support deeper engagement in teaching and learning for students and teachers through reflective practice;
4. To continue to expand the partnership in service of the school.

Methods

Year 4 (2020-21)

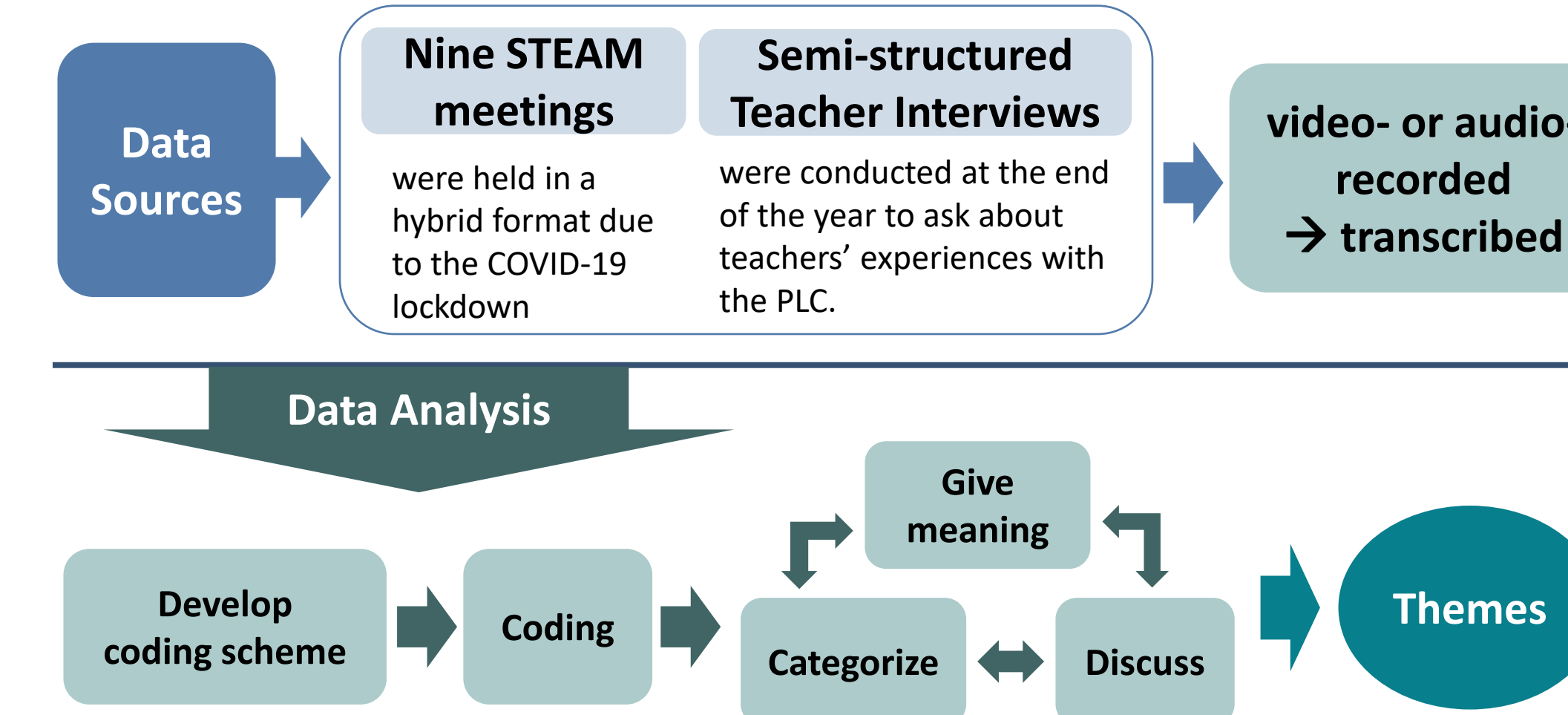
For this study, we selected Year 4 since the school organized STEAM meetings (a type of PLC) to support the interdisciplinary STEAM-based initiative and teacher collaboration.

Who? (Participants: PLC members - five Grade 7&8 teachers, two researchers)

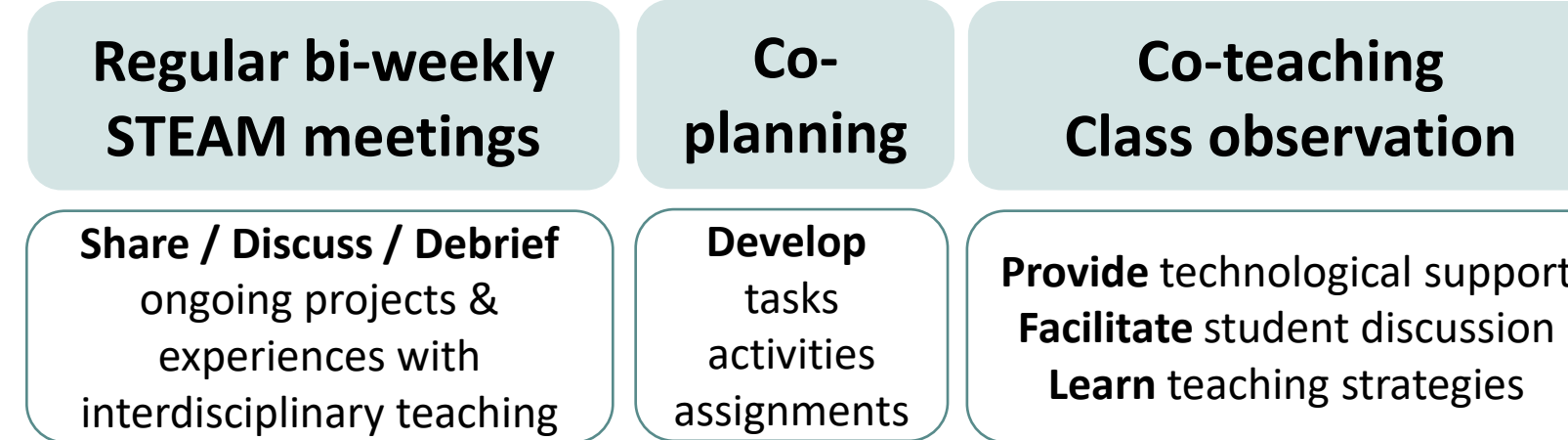


A Qualitative Case Study Approach (Stake, 1995; Yin, 2009)

Qualitative case studies are a qualitative approach in which researchers investigate real-life and contemporary cases (e.g., individuals, small groups, partnerships) over time through the in-depth analysis of data from various sources (Creswell & Poth, 2016). Case studies are appropriate when researchers cannot or do not want to control behavioral events (Yin, 2009). In this study, researchers minimized their intervention and provided information or advice only when requested, with a focus on capturing meaningful cases of teacher learning.



What and How?



Findings

Our findings indicate that the PLC

- 1) allowed teachers to improve the quality of their teaching
- 2) offered teachers opportunities to learn from colleagues' varied experiences and areas of expertise
- 3) provided teachers with emotional support

Theme 1. Improve teaching quality

The PLC helped teachers to make fewer mistakes, work more efficiently by saving time and designing better activities, and provide students with clear instruction through co-teaching.

"You get to create something so great with the less amount of mistakes ... because you've had five brains help you." -Stephanie

"We always had conversations about practice and growth based on what my goals were and what they, like and how they could help me grow. And I thought that was really amazing and I really loved it. -Melissa

"When students have two teachers from different subjects in one classroom, they would then understand even better ... " -Stephanie

Theme 2. Learn from differences

The PLC supports teachers to learn from colleagues' experiences & areas of expertise, including acquiring content knowledge of other subjects, facilitating discussion, using technology, designing assignments, and planning assessments

"When you're working with the same people... you end up doing a lot of things the same, but then we'll actually have to collaborate with somebody else in a different subject to see how they're doing it and how what they're doing might actually be helpful in what you're doing." -Melinda

"I'm stuck in my own way of thinking...through which I look at the world. And having another person is ... like bringing these fresh ideas and you can complement each other ... " -Melissa

Theme 3. Provide emotional support

The PLC allows teachers to relieve the stress of implementing interdisciplinary teaching, remind their own strengths, and be encouraged by colleagues' enthusiastic attitudes and motivation

"I love Melinda. We're on the same page for a lot of things." -Stephanie

"The teacher collaboration is going to kind of just relieve some pressure from my end." -Melinda

"I've never seen Melinda so enthusiastic, full of ideas, full of just motivation... that made me really happy and really excited." -Stephanie

Discussion & Conclusion

- Findings suggest that the PLC supported teachers in implementing interdisciplinary teaching and learning into their practice.
- The PLC enabled teachers to improve their teaching qualities by learning knowledge, expertise, and teaching skills from colleagues in different subject areas.
- Our findings are consistent with previous research that has shown an increase in teaching effectiveness (Graham, 2007) and changes in teachers' practices (Tam, 2015) in PLCs.
- Our study highlights the value of interdisciplinary collaboration as a key resource for teacher learning within the PLC.
- Furthermore, we found that the PLC supported not only professional learning but also psychological aspects for teachers.
- Our study provides an example of the positive impact of interdisciplinary collaboration within a PLC.

References

- Costa, A. R., Ferreira, M., Barata, A., Viterbo, C., Rodrigues, J. S., & Magalhães, J. (2019). Impact of interdisciplinary learning on the development of engineering students' skills. *European Journal of Engineering Education*, 44(4), 589-601. <https://doi.org/10.1080/03043797.2018.1523135>
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- DuFour, R. (2004). What is a professional learning community? *Educational Leadership*, 61(8), 6-11. <https://www.scribd.com/document/3044476/ProfessionalDevelopment/Readings/PLC.pdf>
- Everingham, Y. L., Gyuris, E., & Connolly, S. R. (2017). Enhancing student engagement to positively impact mathematics anxiety, confidence and achievement for interdisciplinary science subjects. *International Journal of Mathematical Education in Science and Technology*, 48(8), 1153-1165. <https://doi.org/10.1080/0020739X.2017.1305130>
- Graham, P. (2007). Improving teacher effectiveness through structured collaboration: A case study of a professional learning community. *Research in Middle Level Education*, 31(1), 1-17. <https://doi.org/10.1080/19404476.2007.11462044>
- Helmane, I., & Briška, I. (2017). What is developing integrated or interdisciplinary or multidisciplinary or transdisciplinary education in school? *Signum Temporis*, 9(1), 7-15. <http://doi.org/10.1515/sigtem-2017-0010>
- Margot, K. C., & Kettler, T. (2019). Teachers' perception of STEM integration and education: A systematic literature review. *International Journal of STEM Education*, 6(1), 1-16. <https://doi.org/10.1186/s40594-018-0151-2>
- Putica, K., & Trivić, D. (2017). Improving high-school students' conceptual understanding and functionalization of knowledge about digestion through the application of the interdisciplinary teaching approach. *Journal of Baltic Science Education*, 16(1), 123-139. https://hdl.handle.net/21.15107/rcub_cherry_2432
- Reichstetter, R. (2006). Defining a professional learning community. *E & R Research Alert*, 6.
- Shernoff, D. J., Sinha, S., Bressler, D. M., & Ginsburg, L. (2017). Assessing teacher education and professional development needs for the implementation of integrated approaches to STEM education. *International Journal of STEM Education*, 4(1), 1-16. <http://doi.org/10.1186/s40594-017-0068-1>
- Stake, R. E. (1995). *The art of case study research*. sage.
- Tam, A. C. F. (2015). The role of a professional learning community in teacher change: A perspective from beliefs and practices. *Teachers and Teaching*, 21(1), 22-43. <https://doi.org/10.1080/13540602.2014.928122>
- Voelkel Jr, R. H., & Chrispeels, J. H. (2017). Understanding the link between professional learning communities and teacher collective efficacy. *School Effectiveness and School Improvement*, 28(4), 505-526. <https://doi.org/10.1080/09243453.2017.1299015>
- Wang, H. H., Charoenmuang, M., Knobloch, N. A., & Tormoehlen, R. L. (2020). Defining interdisciplinary collaboration based on high school teachers' beliefs and practices of STEM teaching using a complex designed system. *International Journal of STEM Education*, 7(1), 1-17. <https://doi.org/10.1186/s40594-019-0201-4>
- Yin, R. K. (2009). *Case study research: Design and methods*. sage.

Acknowledgement

This research is supported by funding from the Social Sciences and Humanities Research Council.