

Introduction

Collaboration is an important 21st century skill that will be key to the success of our students both during and after their secondary education (Kay, 2010). This project focuses on how to better foster collaboration in Grade 11 boys through the use of learning groups in science labs. For the purposes of this study, we adapt the definition of collaborative learning suggested by Engellant, Guzik and Williams (2014) as learning that takes place when students work together in an interactive and interdependent manner toward the goal of "lifelong acquisition of expertise" (Dillenbourg, 1999). The action research framework for this project places the boys in the role of collaborator, increasing engagement and ownership over the results and impacts of our findings.

The Research Question

What is the impact of identifying and developing collaborative skills on the experiences of Grade 11 Boys working in Science Lab Groups?

Research Context and Participants

Upper Canada College is a day and boarding school in Toronto, Canada. 747 boys are currently enrolled at the Upper School in Grades 8-12.

This project involved boys in Grade 11 Biology and Chemistry classes. Grade 11 students were selected because they are at the beginning of their two year International Baccalaureate (IB) Diploma course, and would stand to benefit from this project throughout their IB tenure at UCC, helping to create a culture shift towards collaboration in science.

The challenge experienced and observed in senior International Baccalaureate (IB) chemistry classes, was that students were primarily concerned with their own results and experiences and were resistant to collaboration, thus missing out on the inherent benefits of working with others to the progression of their own knowledge and understanding. Teachers were concerned that the culture of competition in the classroom undermined genuine collaboration.

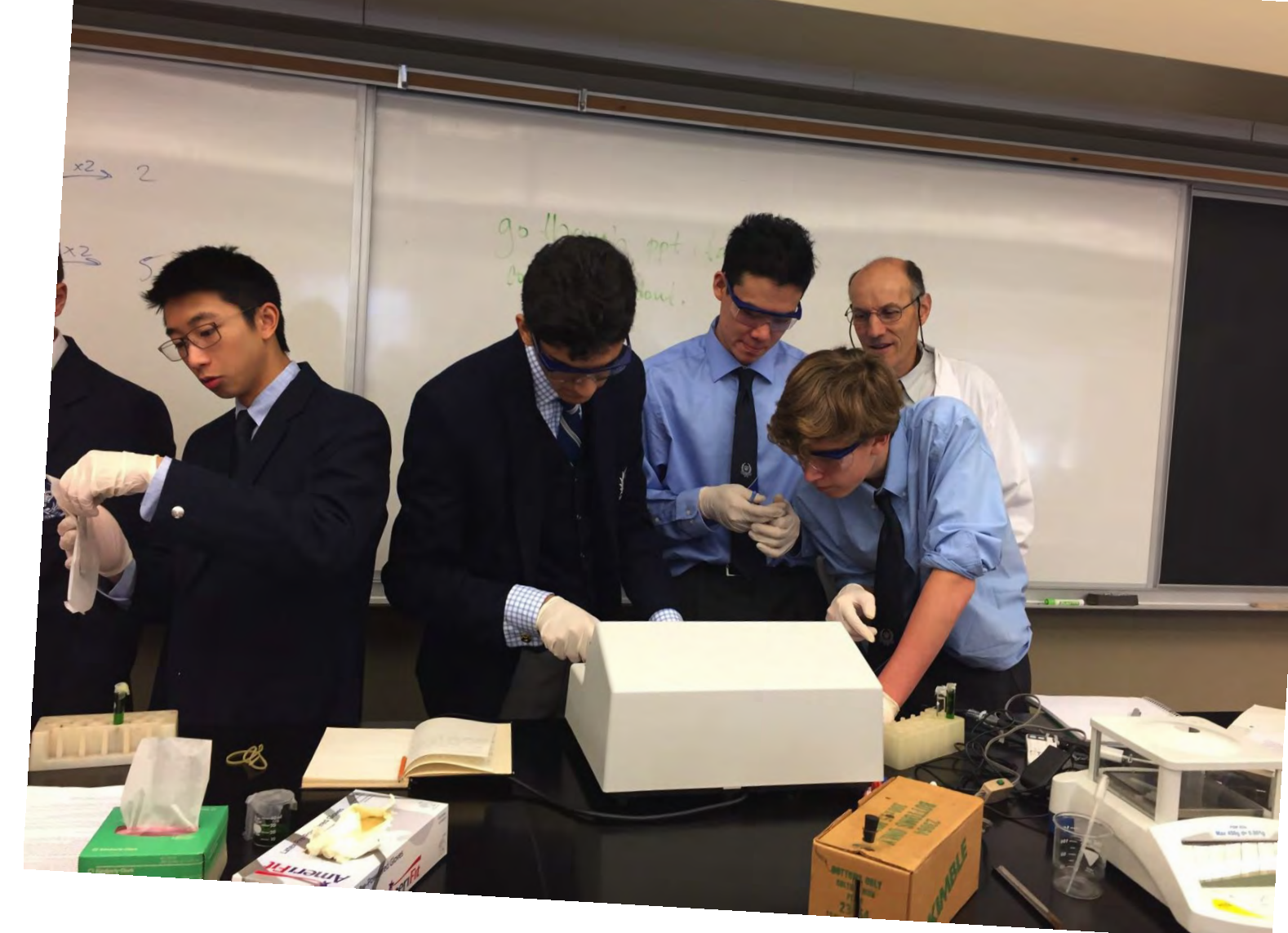
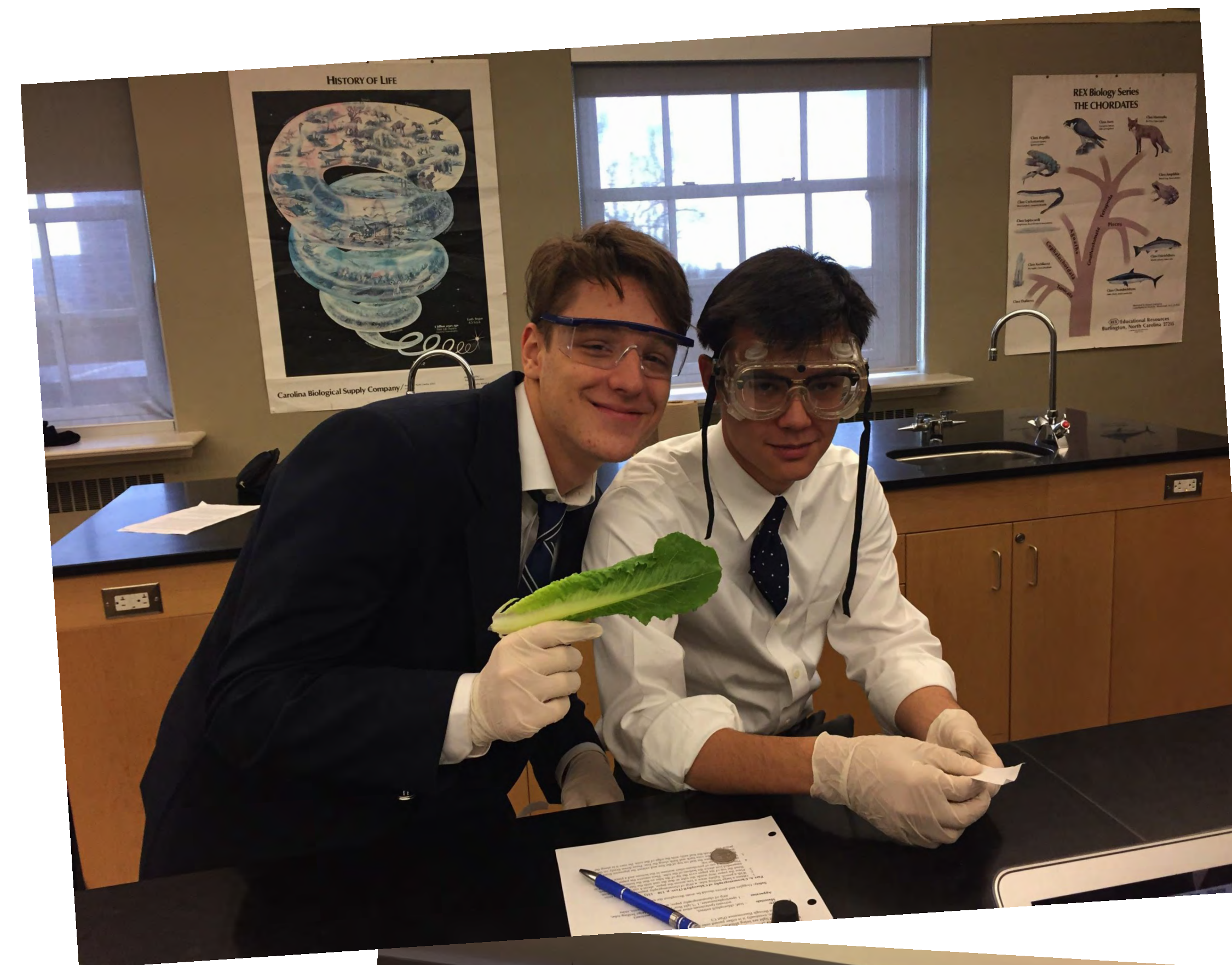
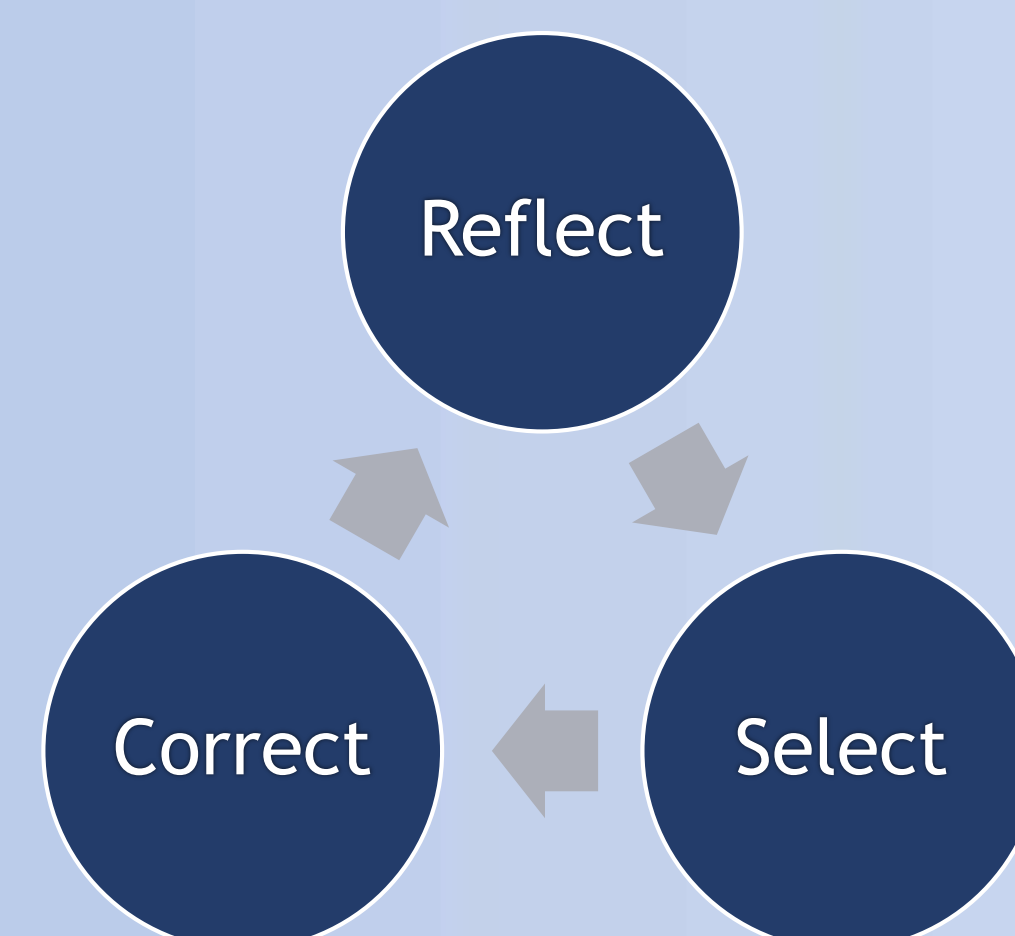
The Research Action

To answer our research question, we implemented the following cycle of action and reflection into our Grade 11 Science classes:

Students were introduced to Harvey & Daniels' (2015) collaborative skills during an introductory class presentation.

Following the introduction to each skill was a discussion on what this skill would look like and sound like in practice.

Students contributed to a class discussion, using their own examples in the context of their own experiences with science lab collaboration. The students then began the cycle of reflecting on their ability, selecting a skill to improve, collaborating in a science lab group, then reflecting on their progress to continue the cycle. Students completed this cycle twice.



"I really liked working in lab groups." - RT

"It is useful to collaborate on lab work because some people are better at one skill than another." - TJ

Data Collection and Analysis

Data were collected using multiple methods to capture the experience of our students as they explored collaboration in lab groups:

- Pre-survey designed to capture the students' pre-existing feelings about collaborative work, their preferred roles in classical group work (leadership), and to reflect on their areas of strength and potential areas of growth.
- Boys' personal electronic journals, a private online space they could communicate with their teacher regarding their contribution and group dynamic.
- Teacher Field notes taken over the course of the study.
- Group Interview to confirm boys agreed findings reflected their experiences.

Students were asked to choose one skill and focus on improving that skill over the course of two lab experiences.

Students performed lab work in groups of three to four, all contributing to their report. Assessment was done with the use of the IB Internal Assessment Criteria Rubric. For each collaborative lab experience, two reflections were written by participants. Collaboration was monitored using the Google Doc revision history functionality. Reflections were coded to identify common themes and patterns amongst responses. Search terms for coding included: success(ful), better, improve(d), challenge, same, worse, group, important, feel(ing), (no) change. The search term frequencies were tallied and the flagged responses further analyzed for themes.

Key Findings and Discussion

- Students shared that they found **collaborative work to be beneficial**.
- Students were successful in **improving collaborative skills**.
- Students felt the lab work, both practical and written, that was completed **collaboratively was of higher quality** than individual labs they had completed.
- Teacher field notes during labs and assessment of group and individual work, confirmed **group labs were of a higher quality than individual labs**.

This student quote captures our experience with this action research project: "Identifying collaborative strategies improves your collaborative skills and improves the team, creating a better atmosphere in the class." Student LM

Conclusions

Student engagement and learning were positively impacted in our Science Labs by the purposeful introduction and development of collaborative skills. This work has opened our eyes to resources for developing collaborative skills. We experienced, and had students validate, the benefit of collaborative lab work. We would like to see this effect of continued review of Harvey & Daniels' skills with these classes over the next year in Grade 12. In addition, future consideration should be given to the benefit of introducing direct instruction on collaborative skills in earlier grades and ages.

Key Readings

- Harvey, S. & Daniels, H. (2009, 2015). *Comprehension & Collaboration*. Portsmouth, NH: Heinemann
- Kay, K. (2010). 21st century skills: Why they matter, what they are, and how we get there. In J. Bellanca & R. Brandt (Eds.), *21st Century skills: Rethinking how students learn*. Bloomington, IN: Learning Tree.
- Reichert, M., & Hawley, R. (2010). *Reaching Boys Teaching Boys*. San Francisco, CA: John Wiley & Sons.