Pathways to Post-Secondary Education: A Multi-Method Investigation of the Impacts of Support Systems and School Belonging on Students' Post-Secondary Intentions

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ABSTRACT

This dissertation explores the factors influencing students' transitions into post-secondary education (PSE) in Canada, focusing on the roles of family, school, and community support systems. The first chapter provides a systematic review of the literature on student transitions, identifying key influences such as family dynamics, geography, and race. The second chapter examines how students' sense of belonging – shaped by parental support, school environment, and teacher relationships – affects their PSE intentions, with a focus on the mediation relationship of race and gender and the moderating relationship of streaming and race. The third chapter presents a case study of an after-school STEM program engaging at-risk and underrepresented youth in Hamilton, Ontario, highlighting the program's role in fostering academic and personal growth, positive PSE attitudes, and sense of belonging. Through this exploration, the dissertation emphasizes the importance of supportive structures both in and outside of school in facilitating successful transitions to PSE. The findings contribute to understanding how educational systems can better support at-risk students in achieving their post-secondary goals.

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CHAPTER 1

Introduction

Canada is regarded as one of the most educated countries in the world, holding the largest share of college or university graduates (57.5% of the working-age population) in the G7[1] (Statistics Canada, 2022). For the 2020/2021 school year, Statistics Canada reported 386, 730 grade 12 high school graduates, 89% of whom graduated from public schools (2022); while there is no corresponding graduation rate for 2021 from the Organization for Economic Co-operation and Development (OECD), they reported a 2020 secondary graduation rate of nearly 86% (2022). The percentage of those students who transitioned directly into PSE institutions is unclear. However, in 2022, approximately 2.19 million students were enrolled in post-secondary institutions in Canada (Statista Research Department, 2024), which represents 5.6% of the country's population in that year.

It is widely known that school and family support systems exist as critical determinants of students' academic success and sense of belonging. Students' perceptions of parental involvement deeply resonate with their academic performance, motivation, and overall satisfaction with life (OECD, 2023). Yet, a gap exists in understanding the nuanced dynamics between support systems, sense of belonging, and post-secondary intentions. Most research analyzes the impacts of support systems or students' sense of belonging respectively, but does not talk about the relationship between the two (For

[1] The G7 is an informal grouping of seven of the world's advanced economies, including France, United States, United Kingdom, Germany, Japan, Italy and Canada (Global Affairs Canada, 2024).

example, see Ahmadi et al. 2020 and Penner et al. 2021). Sense of belonging is the subjective feeling, belief, or expectation of belonging to a group or community of individuals in which an individual feels accepted by others, offering opportunities to interact with like-minded people and ultimately increasing an individual's sense of belonging (Raman, 2014).

Using a mixed-methods approach, each of the three empirical chapters examines these factors, delving into how support systems and belonging affect students' PSE intentions. The dissertation concludes by summarizing key findings, highlighting cross-chapter themes, discussing the study's limitations, and suggesting avenues for future research. Key themes include the importance of holistic support for students, particularly those from marginalized backgrounds, and the need for inclusive and supportive environments to facilitate successful transitions to PSE.

Theoretical and Conceptual Perspectives

There are several theoretical and conceptual perspectives that have been used to investigate students' educational pathways and belongingness. This dissertation has three overarching theories: Belongingness theory, cultural capital, and social capital. While each focuses on different aspects of social interaction and cultural influence, they share several commonalities in this research.

First, each theory has an emphasis on social relationships in educational settings. Belongingness theory emphasizes the need for individuals to feel accepted, valued, and connected in the educational environment (Ahmadi et al., 2020; Baumeister & Leary, 1995), cultural capital focuses on how cultural resources and knowledge are transmitted

through social networks, thus influencing educational outcomes (Collins, 1979; Lareau, 1987), and social capital focuses on the benefits derived from social networks and relationships in terms of one's access to resources, support, and information (Bourdieu, 1986).

Second, each theory can be used to investigate impacts on educational attainment, in that social interactions and cultural influences significantly impact educational achievement and outcomes. Belongingness theory posits that a sense of belonging enhances students' motivation, engagement, and academic performance (Rickert & Skinner, 2022; Willms, 2003). Cultural capital can be used to emphasize how resources acquired through socialization contribute to educational attainment (Bourdieu, 1986), and a social capital framework can suggest that social networks provide access to valuable resources that enhance students' outcomes. Research often identifies support systems through the lens of social capital theory, specifically the impact of teachers and families on a students' development of social capital (For example, see Abada, Feng Hou, and Ram 2009; Croninger and Lee 2001; Dance 2002; Perna and Titus 2005; and Taylor and Krahn 2013).

Third, each theory provides insights into how educational settings can perpetuate or challenge social inequality. Employing a belongingness lens, we see that social exclusion, marginalization, and a lack of sense of belonging can negatively impact educational success, but that belonging to a social group within the educational setting, and feeling accepted by peers, can help to improve the outcomes of marginalized and at-risk youth. Cultural capital can be used to critique how the unequal distribution of cultural

resources perpetuates educational disparities, and social capital can be employed to examine how unequal access to social networks and resources can reproduce or challenge socioeconomic disparities in education. Thus, while belongingness, cultural capital, and social capital theories offer unique perspectives, they converge in their emphasis on social relationships, social contexts, and cultural influences in shaping students' school belonging and post-secondary intentions.

Data Source

Data for this dissertation come from a systematic review of academic literature, the Toronto District School Board (TDSB) 2016/17 Student Census, and Mathstronauts' Nexus Program Report.

Chapter 2: Systematic Review

Using the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol", we searched McMaster University's OMNI database and Google Scholar. We used the following phrases: (1) "Canadian post-secondary transitions;" (2) "Factors influencing post-secondary transitions/attendance in Canada;" (3) "High-school graduation and post-secondary transitions;" and (4) "High-school students' post-secondary pathways." To capture a representative sample of the current Canadian landscape of PSE transitions, we limited our search to articles that were (1) published between 2000-2024; (2) analyzed factors influencing student transitions into PSE in Canada; (3) used empirical data to understand student transition rates; and (4) focused on transition rates for students between grades 9-12. In our initial search of the McMaster Omni Database, we identified 244 results, which were then refined using our parameters

to approximately 95 results. Our initial search of Google Scholar produced 17,000 results, which was then refined to approximately 190 results. In total, we identified 285 eligible results in the two databases combined. We then removed all articles focused on non-Canadian educational systems and articles about post-secondary persistence and filtered them into three time-periods: 2000-2009, 2010-2019, and 2020-2024. Filtering the articles into time periods allowed us to identify any possible changes in emphasis on the major themes and the introduction of new themes and/or data. While there is relevant research from 1990-1999, we focused on research in the past 24 years to focus on the more modern trends in the literature.

After removing duplicate articles and further analysis of titles, abstracts and keywords for relevance to our search parameters, we were left with n=63 articles that made up the basis of this review (see Figure 1 in Chapter 2).

Chapter 3: TDSB Student Census Data

Chapter 3 uses data 2016-2017 TDSB Student Census data. The census contains key student socio-demographic information including racial identity, gender, first language, religion, birthplace, etc., parental socio-demographic information including level of education, type of household (single, two-parent, guardian, etc.), employment status, etc., and student experiences in and outside of school. The census data are also merged with administrative data from the school board that are collected in the course of daily business (attendance records, grades, etc.). The data are structured as four cohorts: 2013, 2014, 2015, and 2016, and each cohort demarcates when a group of students entered grade 9 and the relevant student census variables from 2016/2017 are matched to

each student. The student census is divided into two parts: Part A and Part B. Students who completed the Student Census Part A had different questions from those who completed Census Part B, except for socio-demographic questions and two other substantive questions about relationships to school and experiences in the past year. The variables used for this study (outlined below) were found in both form A and B of the Student Census. After focusing on the variables of interest and removing missing cases, we were left with n=19,948.

Chapter 4: Mathstronauts' Nexus Program Report

Chapter four employed an instrumental case study method to longitudinally collect and analyze data from the Mathstronauts' Nexus Program Report. This project started as a Mitacs Accelerate Partnership between myself, Dr. Karen Robson, and Mathstronauts, and the organization allowed me to use the data collected for the program report for my dissertation. The research design for the report included analyses and assessments of qualitative and quantitative data collected using surveys and focus groups. We had 21 research participants and 5 non-research participants for a total of 26 program participants. Research participants participated in the program free of cost (usually a $200 value per person), while non-research participants paid the program fee. Table 1 in Chapter Four outlines participant demographic characteristics by percentage.

We used Google Forms to create and distribute surveys to our participants. We chose to use this platform as participants were also using Google platforms within the program. Participants completed three surveys: 1) at the beginning of the program (S1); 2) upon completion of the program (S2), and 3) a follow-up five months after program

completion (S3). We also conducted two focus groups over the course of the program which identified potential areas of improvement, impressions and attitudes surrounding the program, and identified how the participants hope to use their new skills in the future, both in educational settings and in their personal lives.

Overview of the Dissertation

Each of the core chapters (chapters two to four) in this dissertation examine distinct aspects of student experiences and systemic influences on PSE transitions. They are separate manuscripts but when combined demonstrate the wide-ranging and interconnected factors – ranging from family support to extracurricular programs – that collectively affect students' pathways to PSE. Chapter One presents a systematic review of PSE transition rates and their influencing factors identified in Canadian literature. In this review we ask, what is the current Canadian landscape around student transitions into PSE, and what factors influence student transitions? Using systematic review and reflective thematic analysis, this paper foregrounds the remainder of the dissertation as it provides several avenues to discuss the impacts of support systems and belonging on student transitions into PSE. This chapter was published in the *Social Sciences and Humanities Open* Journal with Dr. Karen Robson and Dr. Robert Brown. In preparing this manuscript, I contributed approximately 80% of the research and writing efforts. My co-authors, Robson and Brown, contributed to supervision and providing expert feedback and revisions for preparing the manuscript for publishment.

In Chapter Two, 2016-2017 TDSB Student Census was used to investigate factors influencing students' sense of belonging in school and their post-secondary intentions. In

this chapter we ask three broad questions: (1) What type of school and parental supports can be considered in assessing a students' sense of belonging, and what impact do these types of belonging have on students' intentions to pursue post-secondary education? (2) Do race and gender mediate the relationship between belongingness and post-secondary intentions? And (3) does academic streaming play a role in students' feeling of belongingness and post-secondary intentions? This chapter was written with Dr. Karen Robson and was summitted to the *Canadian Review of Sociology.* In preparing this manuscript, I contributed approximately 70% of the research and writing efforts. My co-author, Karen Robson, contributed to supervision, access to the dataset, and provided expert feedback and revisions on data analysis, preparation of the manuscript for publishment.

Chapter Three presents a case study on an intervention strategy in supporting successful PSE transitions by way of an after-school STEM program for high school students called *NEXUS. NEXUS* is offered by the non-profit organization called Mathstronauts in Hamilton, Ontario as an online program. This case study identifies the importance of PSE support provided by after-school programs, and the impact of support systems through the experiences of students. It asks, what role can after-school PSE preparation programs play in supporting the educational pathways of students? And what support gaps, if any, do these programs fill? This chapter was written with Dr. Karen Robson and Sehrish Zehra, the Executive Director of Mathstronauts. In preparing this manuscript, I contributed approximately 70% of the research and writing efforts, which included completing the funding and ethics applications, participant recruitment, data

collection and analysis, writing the manuscript, and subsequent journal revisions. This chapter is in review with *The McGill Journal of Education*. My co-authors, Robson and Zehra, contributed to supervision, assistance with the funding and ethics applications, recruitment on the Nexus program level, providing expert feedback and revisions on data collection, analysis and in preparing the manuscript for publishment.

The conclusion of this dissertation summarizes the general findings of each of the chapters in a discussion of their interconnected qualities, and concludes with several directions for future research.

References

Abada, T., Hou, F., & Ram, B. (2009). Ethnic Differences in Educational Attainment Among the Children of Canadian Immigrants. *Canadian Journal of Sociology*, *34*(1), 1–29.

Ahmadi, S., Hassani, M., & Ahmadi, F. (2020). Student- and school-level factors related to school belongingness among high school students. *International Journal of Adolescence and Youth*, *25*(1), 741–752. Doi: 10.1080/02673843.2020.1730200

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. Doi: 10.1037/0033-2909.117.3.497

Bourdieu, P. (1986). The Forms of Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 46–58). Oxford University Press.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative*

Research in Sport, Exercise and Health, *11*(4), 589–597. Doi: 10.1080/2159676X.2019.1628806

Clarke, V., Braun, V., & Hayfield, N. (2015). Chapter 10: Thematic Analysis. In J. A. Smith, *Qualitative Psychology: A Practical Guide to Research Methods* (3rd ed., pp. 222–248). SAGE Publications.

Collins, R. (1979). *The Credential Society; An Historical Sociology of Education and Stratification*. Academic Press.

Croninger, R. G., & Lee, V. E. (2001). Social Capital and Dropping Out of High School: Benefits to At-Risk Students of Teachers' Support and Guidance. *Teachers College Record*, *103*(4), 548–581. Doi: 10.1111/0161-4681.00127

Dance, L. J. (2002). *Tough Fronts: The Impact of Street Culture on Schooling*. Routledge Falmer.

Global Affairs Canada. (2024). *Canada and the G7*. GAC. https://www.international.gc.ca/world-monde/international_relations-relations_internationales/g7/index.aspx?lang=eng

Lareau, A. (1987). Chapter 46: Social-Class Differences in Family-School Relationships: The Importance of Cultural Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 703–717). Oxford University Press.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P.,

& Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*(1). Doi: 10.1186/2046-4053-4-1

OECD. (2022). *Secondary graduation rate (Indicator)*. OECD. http://data.oecd.org/students/secondary-graduation-rate.htm

OECD. (2023). *Review education policies: Student engagement and motivation*. OECD: Education GPS. https://gpseducation.oecd.org/revieweducationpolicies/#!node=44131&filter=All

Penner, K., de Moissac, D., Rocque, R., Giasson, F., Prada, K., & Brochu, P. (2021). Sense of Belonging and Social Climate in an Official Language Minority Post-Secondary Setting. *Canadian Journal of Higher Education*, *51*(4), 26–39. Doi: 10.47678/cjhe.v51i4.189087

Perna, L. W., & Titus, M. A. (2005). The Relationship between Parental Involvement as Social Capital and College Enrollment: An Examination of Racial/Ethnic Group Differences. *The Journal of Higher Education*, *76*(5), 485–518.

Raman, S. (2014). Sense of Belonging. In A. C. Michalos (Ed.), *Encyclopedia of Quality of Life and Well-Being Research* (pp. 5828–5831). Springer Netherlands. Doi: 10.1007/978-94-007-0753-5_2646

Rickert, N. P., & Skinner, E. A. (2022). Parent and teacher warm involvement and student's academic engagement: The mediating role of self-system processes. *British Journal of Educational Psychology*, *92*(2), 667–687. Doi: 10.1111/bjep.12470

Statista Research Department. (2024). *Number of students enrolled in postsecondary institutions in Canada from 2000 to 2022*. Statista. https://www.statista.com/statistics/447739/enrollment-of-postsecondary-students-in-canada/

Statistics Canada. (2022, November 30). *The Daily—Canada leads the G7 for the most educated workforce, thanks to immigrants, young adults and a strong college sector, but is experiencing significant losses in apprenticeship certificate holders in key trades*. Statistics Canada - The Daily. https://www150.statcan.gc.ca/n1/daily-quotidien/221130/dq221130a-eng.htm

Statistics Canada. (2022). *Elementary–Secondary Education Survey, 2020/2021*. https://www150.statcan.gc.ca/n1/daily-quotidien/221013/dq221013a-eng.htm

Taylor, A., & Krahn, H. (2013). Living Through Our Children: Exploring the education and career 'choices' of racialized immigrant youth in Canada. *Journal of Youth Studies*, *16*(8), 1000–1021. Doi: 10.1080/13676261.2013.772575

Willms, J. D. (2003). *A Sense of Belonging and Participation*. Organisation for Economic Co-operation and Development.

CHAPTER 2

WHO TRANSITIONS INTO POST-SECONDARY EDUCATION AND WHY? A SYSTEMATIC REVIEW OF THE CANADIAN LANDSCAPE

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Who transitions into Post-Secondary Education and Why? A Systematic Review of the Canadian Landscape

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Abstract

Decades of research have documented rates of student transitions into post-secondary education (PSE). A large majority of secondary students expect to obtain some level of PSE and are either motivated by their own personal interest, parental influences, or economic reasons. In 2020, The Organization for Economic Co-operation and Development (OECD) reported that Canada had an 86% secondary graduation rate. The percentage of those students who transitioned directly into post-secondary institutions is unclear, as enrolment rates can include direct and delayed entry. Using systematic review methods and reflective thematic analysis, we identified trends in the literature that cite family influences geographic influences, sex, various school influences, and race and ethnicity as key impacts on students' decisions to transition to PSE.

Keywords

Post-secondary education; Transitions; Systematic Review; Canada.

Decades of research have documented the rates of student transitions into post-secondary education (PSE) in Canada, highlighting intersecting predictors of participation in PSE including family influences (parental education and expectations, financial status, family structure), sex and gender, geographic location, school influences (grades, absenteeism, and achievement), and demographic factors including race, ethnicity, immigrant status, age, and Indigenous identity (Andres & Looker, 2001; Friesen & Purc-Stephenson, 2016; Gorman-Asal et al., 2021; Krahn & Taylor, 2007; Robson et al., 2018). The current study offers a synthesis of these scores of studies on the determinants of PSE transitions across the country.

In Canada, most secondary students expect to obtain some level of PSE. However, the decision to not attend PSE is often influenced by a range of barriers such as financial, academic, current employment and geographic limitations (Cheung, 2007). In 2020, the Organization for Economic Co-operation and Development (OECD) reported that Canada had a secondary graduation rate of nearly 86% (2022). The percentage of those students who transitioned directly into PSE institutions is unclear; however, in the 2020/2021 school year, 13% of 18-24 year-olds were attending college, while 32% were attending university[2] (Statistics Canada, 2024). In 2021-22, there were over 1.8 million full-time equivalent (FTE) students in Canadian PSE institutions, with a little over one-third enrolled in colleges and just under two-thirds in universities (Usher & Balfour, 2023). This number of FTE students represents 4.7% of Canada's population in 2020.

[2] Statistics source: Labour Force Survey. While this does not provide a longitudinal representation of PSE transitions, it is representative of the population of students who would be graduating high-school and transitioning into post-secondary endeavours.

The research landscape documenting the rates of PSE transitions in Canada and their various influencing factors is extensive. Several provinces, including British Columbia and Ontario, have high-school administrative data available upon request (subject to application and ethics protocols), which researchers can link to Post-Secondary Student Information System (PSIS) files to gain deeper insights into these transition trends. Specifically, the Education and Labour Market Longitudinal Platform (ELMLP) (Government of Canada, 2024) allows longitudinal integration of administrative data related to education with other data sources to create an anonymized, customized dataset. It allows for greater understanding and exploration of student and apprenticeship pathways, transitions to the labour market and outcomes over time[3] (Government of Canada, 2024).

In consideration of the available datasets for studying PSE transitions, this presents an opportune time to conduct a systematic review that assesses the overall Canadian landscape of PSE transitions research. We identified thematic trends in the literature that cite family influences (parental education, involvement in their child's education, expectations, etc.), geographic influences, sex, various school influences, and race and ethnicity as key impacts on students' decisions to transition to PSE. These thematic trends are analyzed first as proportional trends by decade to show the trajectory and developments in PSE transition research, and second as a descriptive interpretation of results from the literature. Our concluding thoughts identify gaps in the literature that can

[3] Researchers can access ELMLP datasets through Statistics Canada's Research Data Centres (RDCs), which involves a lengthy approval/authorization process.

serve as catalysts for improvements to post-secondary preparation and can help to pinpoint where students need additional support to succeed; furthermore, it also presents the necessity of up-to-date data collection for understanding the barriers students face when graduating high school with ambition and interest in pursuing PSE.

Capital Theories and Post-Secondary Decision-Making

The aim of this review was to investigate the factors that influence students' PSE transitions in Canada. Students' PSE decisions can be understood through critical engagement with theories of inherited intellectual and cultural capital and Student Choice Model, which represent common theoretical trends in this research area. Engaging with these theories helps frame the broader trends and influences identified in the literature, offering a deeper conceptual understanding of how various factors interact in shaping students' decisions to pursue PSE.

Intellectual capital can be defined as the knowledge and experiences acquired by an individual or group throughout their lives that can be applied while pursuing social and economic goals (de Broucker & Lavallée, 1997). Intellectual capital is inherited from the family environment and acquired or developed through familial interactions over time; notably, it has an indirect impact on educational attainment, influencing one's path through schooling and adult life (de Broucker & Lavallée, 1997). While intellectual capital focuses on inherited and developed intellectual knowledge and experiences, cultural capital consists of cultural outlooks and predispositions developed in the home environment that an individual invests in education (Collins, 1979). In education, it consists of behaviours, knowledge, values, and languages that signify the dominant

class's high status. Cultural capital is a key determinant of students' progress in school (Collins, 1979); students who come from higher-status families and possess dominant cultural capital are often viewed as more intelligent and capable of succeeding in school, whereas schools systematically devalue the cultural capital of students who are from lower-class families (Apple, 1979; Bourdieu & Passeron, 1990; Lareau, 1987; Stuart Wells & Serna, 1996). Parents are also a source of cultural capital and are found to have a moderate influence on their children's post-secondary choices and completion (Andres & Grayson, 2003).

Both intellectual and cultural capital develop over time in the family environment and influence educational attainment. The more intellectual and cultural capital parents have, the more likely they are to pass it down to their children, and the more likely they are to improve their children's' educational opportunities for the future – creating generational forms of capital and achievement. The power imbalance between students that results from conflicting levels and types of cultural capital can have a major impact on how students internalize their social relationships with teachers and peers, their ability to engage in effective learning experiences, and their educational pathways.

There is a positive association between education, persistence in school, and cultural dispositions inherent in the relationship of culture, gender, and class (Kamanzi et al., 2009). A student's academic performance and achievement is identified as the outcome of family mobilization, transmission of cultural habits, and skills/dispositions learned both within and outside of the school. PSE transition rates are strongly linked to family characteristics including parental education, parent expectations, family

type/structure, and family income (Cheung, 2007; Finnie & Mueller, 2017; Friesen & Purc-Stephenson, 2016; Krahn & Hudson, 2006).

When considering the impacts of inherited intellectual and cultural capital on students' PSE transitions, it is important to set a foundation for understanding the decision-making process. McDonough (1997) outlined three basic approaches to the study of student choice: (1) social psychological studies examine cost, location, social climate, academic program, and influence of others' opinions on student choice; (2) economic studies consider the decision to attend post-secondary, and what institution to attend, from an investment perspective; (3) sociological status attainment studies analyze the impact of one's social status on the aspirations for educational attainment. We believe aspects of these three approaches can also be used together in sociological investigation, as students' PSE decisions are impacted by interactions between social status, identity, geographic location, social climate, influence of others' opinions – just to name a few.

Hossler and Gallagher's 1999 model of college choice (Hossler et al., 1999) breaks down the process into three phases, (1) predisposition; (2) search; (3) and choice. Predisposition is characterized by the level of desire to attend post-secondary, which includes one's beliefs and values on the importance of post-secondary, and the requirements for their future goals. The search phase in which students explore their options is strongly influenced by parents and their expectations, level of education, and family income/economic status. During the final phase of choosing a PSE route, students are influenced by both economic and social factors. Thus, this model relates to this systematic review by highlighting how early predispositions, shaped by family,

demographic, and school influences, impact students' initial intentions to pursue PSE. The search and choice phases correspond to the factors identified in the article, such as geographic limitations, financial barriers, and academic achievement, which influence students' decision-making processes and actual transitions to PSE. While there are various other theories and concepts that can be (and have been) engaged with to study topics in PSE transitions, inherited intellectual and cultural capital and Student Choice Model were chosen for this systematic review for several reasons, notably for their applicability on macro-, meso-, and micro levels of theoretical analysis and for their frequent presence in studies on PSE transitions.

Methods

Systematic review

A systematic review serves as a comprehensive review of various databases and attempts to include all available and relevant data on a specific topic (Newman & Gough, 2020). For our purposes, this method enables an investigation of whether the factors impacting PSE transitions vary across studies in the literature. We can identify specific areas where more research is required, which includes identifying where the findings are inconsistent. This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2015) and incorporates the reflective thematic analysis process (Braun & Clarke, 2019).

Using the PRISMA protocol, we searched McMaster University's OMNI database and Google Scholar. We used the following phrases: (1) "Canadian post-secondary transitions;" (2) "Factors influencing post-secondary transitions/attendance in Canada;"

(3) "High-school graduation and post-secondary transitions;" and (4) "High-school students' post-secondary pathways." To capture a representative sample of the current Canadian landscape of PSE transitions, we limited our search to articles that were (1) published between 2000-2024; (2) analyzed factors influencing student transitions into PSE in Canada; (3) used empirical data to understand student transition rates; and (4) focused on transition rates for students between grades 9-12. In our initial search of the McMaster Omni Database, we identified 244 results, which were then refined using our parameters to approximately 95 results. Our initial search of Google Scholar produced 17,000 results, which was then refined to approximately 190 results. In total, we identified 285 eligible results the two databases combined. We then removed all articles focused on non-Canadian educational systems and articles about post-secondary persistence and filtered them into three time-periods: 2000-2009, 2010-2019, and 2020-2024. Filtering the articles into time periods allowed us to identify any possible changes in emphasis on the major themes and the introduction of new themes and/or data. While there is relevant research from 1990-1999, we focused on research in the past 24 years to focus on the more modern trends in the literature.

After removing duplicate articles and further analysis of titles, abstracts and keywords for relevance to our search parameters, we were left with n=63 articles that made up the basis of this review (see Figure 1). It is important to note that this is not an exhaustive systematic review of available literature; we acknowledge there are other

articles and research reports[4] that may have been left unidentified by our chosen databases. This review is meant to identify common themes and trends in research on PSE transitions and to present avenues for future exploration.

Data Analysis

We used reflective thematic analysis to conduct a systematic review of Canadian research on student transitions into PSE. In their original work published in 2006, Braun and Clarke (2019) identified six phases of thematic analysis, which are presented in figure 1. In implementing reflective thematic analysis into our research process, we created space for developing a thoughtful understanding of the Canadian landscape of PSE transitions and why the following factors are so impactful in the process.

[4] Research reports identified in our systematic review include reports by the Higher Education Quality Council of Ontario (HEQCO) and the Social Research and Demonstration Corporation (SRDC). We acknowledge that while these organizations (and others) have a variety of relevant reports, we only included those identified in our systematic review process outlined in our methods section.

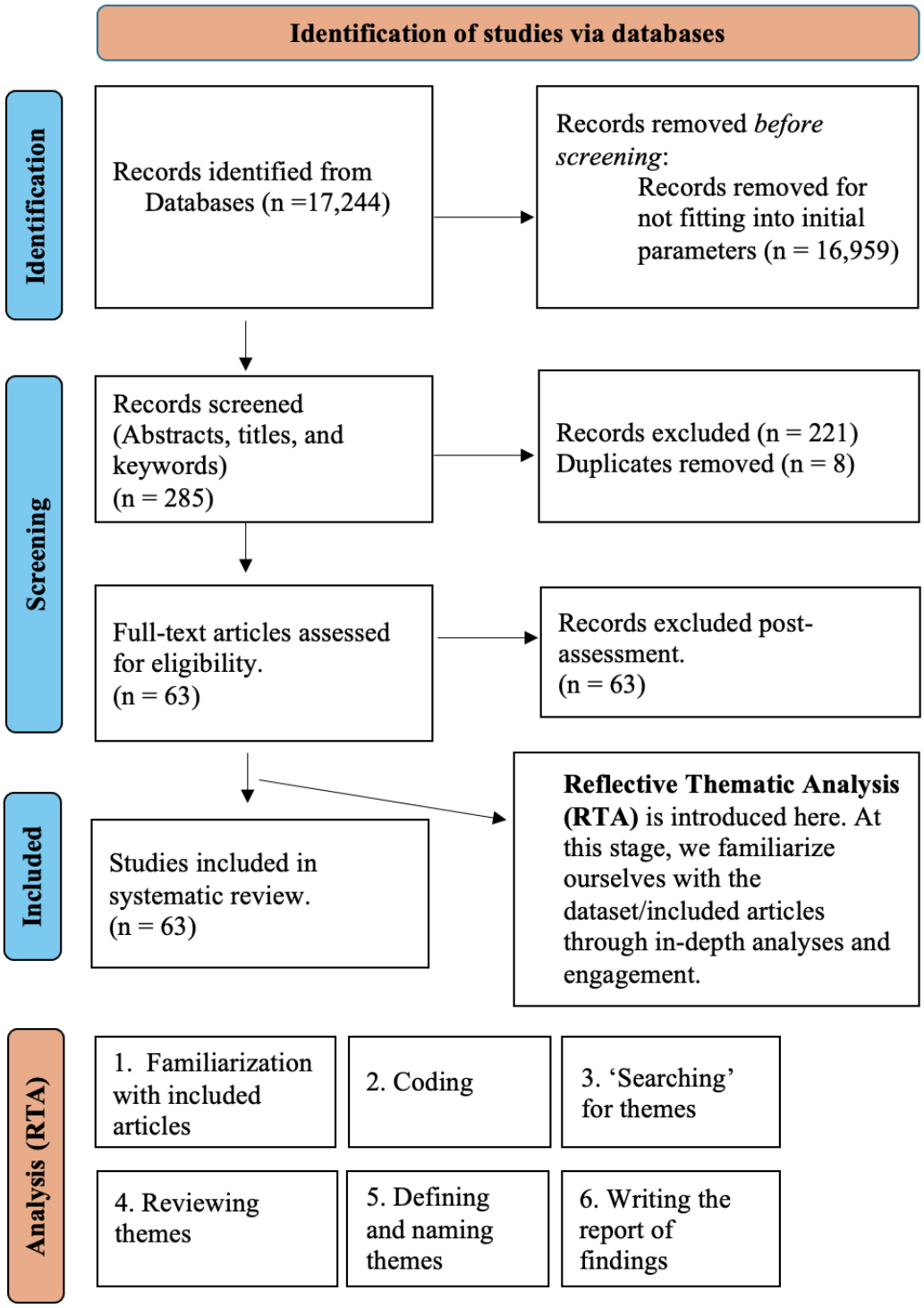

Figure 1. *Systematics Review and Reflective Thematic Analysis process.*

Methodological and Thematic Details of Included Literature

We grouped the articles into several time-periods: 2000-2009, 2010-2019, and 2020-2024. We first sought to understand where the data in the included sources came from to identify trends and scopes of study. Across all years, the Youth in Transition Survey (YITS/YITS-A) is a data source commonly used by researchers but it was discontinued in 2010, so we suspect there will be less use of this data as we continue through the 2020s. There is also frequent interaction with Toronto District School Board (TDSB) data, British Colombia education data, and several longitudinal research projects. We identified a small amount of qualitative/mixed methods research, which is a common occurrence in studies school-aged youth considering lengthy ethics review processes, project funding, and timelines.

Table 1 presents a breakdown of the themes identified in the literature by time period. In 2000-2009, the most common themes in the literature were the impact of parental education on post-secondary transitions (58%) and family income/SES (42%). During this time period, researchers had access to the YITS which was first administered alongside the PISA in 2000, but the YITS was then discontinued in 2010. In 2010-2019, the most common themes were equally parental education and immigrant status; parental education was identified in 10% less articles than in 2000-2009, and immigrant status was identified in 25% more articles than in the previous decade. We see an uptake in themes of race and ethnicity in 2010-2019 (44%), and in 2020-2024 we see race and ethnicity discussed in 33% of articles.

Since the introduction of the ELMLP in 2018, we have seen significant advancements with PSE transition literature, particularly when it comes to linking school

board and national datasets. While very few articles were identified for 2020-2024, we can see the beginnings of a few new research trends; first, engagement with the ELMLP persists, and this data platform will only continue to evolve as updated survey results for existing datasets and new datasets are added. Second, there seems to be an uptake in studies on absenteeism, race and ethnicity, delayed entry/ "no go-ers," and special education needs (SEN), and the impact of the COVID-19 pandemic. These trends show that while parental/family influences, sex, race and ethnicity, and immigrant status are the most common themes across the past 24 years, there are trends emerging in the later years that are important indicators and impacts to focus on moving forward.

Thus, overall, research on PSE transitions has undergone a generational transformation over the past several decades. The early scholars in this field focused much more on socioeconomic status (including parental education and family structure), while the new wave of scholars now emphasizes an intersectional approach to research while still emphasizing the importance of parental education, SES, and grades/achievement. The new wave highlights and unpacks the complex, often nuanced relationships between identity, familial, societal, and institutional factors.

Table 1. *Breakdown of systematic review themes by time period.*[5]

	Time periods			Total years
	2000-2009	2010-2019	2020-2024	2000-2024
Total no. of sources	26	25	12	63
Theme: n (%)				

[5] The following articles are not discussed in this article but were identified in the systematic review: Adamuti-Trache and Andres, 2008; Andres and Adamuti-Trache, 2008; Andres and Adamuti-Trache, 2009; Andres et al., 2007; Finnie and Mueller, 2009a; Finnie and Mueller, 2009b; Finnie and Mueller, 2007; Gallagher-Mackay and Brown, 2021; Hango et al., 2021; Hillier et al., 2023; Hira-Friesen et al., 2013; Kamanzi and Collins, 2021; Sheppard, 2023; Sweet et al., 2019; Vaccaro, 2012.

Parental education	15 (58%)	12 (48%)	4 (33%)	31 (49%)
Parental expectations and involvement	5 (19%)	3 (12%)	0 (0%)	8 (13%)
Family type/structure	3 (12%)	0 (0%)	1 (8%)	4 (6%)
Family income/household resources/SES	11 (42%)	11 (44%)	4 (33%)	26 (41%)
Provincial	5 (19%)	3 (12%)	0 (0%)	8 (13%)
Rural vs. urban	4 (15%)	7 (28%)	1 (8%)	12 (19%)
Sex	9 (35%)	7 (28%)	1 (8%)	17 (27%)
Grades and achievement	9 (35%)	2 (8%)	3 (25%)	14 (22%)
Absenteeism	0 (0%)	0 (0%)	2 (16%)	2 (3%)
Commitment/engagement	5 (19%)	0 (0%)	0 (0%)	5 (8%)
Race and ethnicity	5 (19%)	11 (44%)	4 (33%)	20 (32%)
Immigrant status	6 (23%)	12 (48%)	1 (8%)	19 (30%)
Delayed entry/ “no go-ers”	3 (12%)	1 (4%)	2 (16%)	6 (9%)
Special education needs (SEN)	0 (0%)	2 (8%)	2 (16%)	4 (6%)
COVID-19 pandemic	0 (0%)	0 (0%)	1 (8%)	1 (2%)

Findings

We identified seven major themes in our analysis, family influences, geographic influences, sex, school influences, race and ethnicity, immigrant status, and delayed entry/ “no go-ers.” The following review describes the findings by theme using key points highlighted in the literature.

Family influences

Parental Education

Overall, the literature shows that even after accounting for a wide range of other factors, parental education plays an important part in determining who goes on to PSE (Andres & Looker, 2001; Finnie et al., 2005; Friesen & Purc-Stephenson, 2016; Robson et al., 2021). It is important to note that parental education exerts an influence on educational attainment that is stronger and unique from the influence of parental income;

recent research shows that parental education plays an significant role in PSE access, whereas parental income is an important determinant of socioeconomic status attainment, and a driver of inequalities post-graduation from PSE among children with similar levels of educational attainment (St-Denis & Renée, 2022). This finding reflects that of research conducted by Finnie and Mueller (2008) 14 years earlier who found that parental education (and various related influences including reading scores and high school engagement), not parental income, is what largely drives students to attend PSE in general.

There are several contentions in the literature about the impact of parental education on PSE transitions. For example, in a study on the links between family environment, family habits, and cultural experiences, Childs et al. (2010) note that parental education had no impact on college attendance but was strongly related to university attendance. Drolet (2005) explains the higher a parent's level of education, the more likely their child was to attend any PSE. Children whose parents had a high school education or less were just as likely attend college as children whose parents had a university degree (Drolet, 2005).

Lambert et al. (2001) found that 61% of YITS respondents whose parents had a high school diploma and never went onto PSE continued to some form of PSE, compared to 83% whose parents received a PSE certificate or diploma. Youth were more likely to seek a non-university program, or not want to pursue education after high school at all if their parents did not pursue PSE, whereas those whose parents had PSE credentials were more likely to seek a university education (Cheung, 2007).

Interestingly, Friesen and Purc-Stephenson (2016) found that some youth used their parents' level of education as motivation, or a 'yardstick,' for their expected educational attainment, while others were cautious to attain a higher level of education than their parents. Although most participants believed their parents would support them regardless of their PSE decisions, almost half believed their parents' level of education influenced their decisions, and most expected to follow their parents' educational pathways. This supports characteristics of inherited intellectual capital theory in that students inherit knowledge, experiences, and values toward education from their parents, which then translates to how they move and make decisions throughout their educational pathway.

We identified intersections between parental education and immigrant status. Jennifer Rae (2018) notes that students whose parents were immigrants and college or university educated were much more likely to participate in PSE compared to youth whose parents only attained a high school education or lower. Abada et al. (2009) found that children of immigrant parents attained higher university completion rates than children of Canadian-born parents, which was moderately influenced by their parents' education levels.

Parent Expectations and Involvement

Parental education has a significant influence on their expectations for their children to attend PSE and their involvement in their education, which influences children's decisions to attend PSE (Areepattamannil & Lee, 2014; Drolet, 2005; Finnie et al., 2015). Parental involvement in their child's educational pathway is a form of social

capital that could encourage PSE enrolment, as parents convey norms and standards to their children through various forms of communication and can either reinforce or challenge the social norms emphasized within the school environment. According to Shaienks et al. (2008), the university participation rate was almost four times as high when parents believed higher education was important. Similarly, Lambert et. al.(2001) concluded that only 37% of participants ever participated in PSE if their parents did not find pursuing education after high school important, compared to 76% whose parents believed it was important to pursue PSE of any form after high school.

Canadian households in which one or more parents were immigrants tended to place high value on higher education, and most parents assumed their children would attend a PSE program (Abada et al., 2009; T. Collins & Magnan, 2018; Krahn & Taylor, 2005; Montazer & Wheaton, 2011). Given the difficult process of immigration, many immigrant parents believed that the most effective way for their children to succeed as citizens in Canada was to follow an academic path in which they graduate from high school and continue into PSE (Areepattamannil & Lee, 2014). The preferred PSE pathway by most immigrant parents was university, especially when both parents were foreign-born; that said, in some instances, students from these families attended college rather than university due to barriers in accessing adequate financial support (Krahn & Taylor, 2005; Sweet et al., 2010).

Family type/structure

Abada et al. (2009) found that family structure was associated with a student's level of educational attainment. However, theoretical research not included in the

systematic review pointed to faults in both single-parent families and the nuclear family (Coleman, 1988). In a single-parent household there tended to be a lack of parent-child interaction both in terms of physical presence and general attention given to the child. In the nuclear family, children lacked the social capital accumulated during the day when their parents were working away from the household. Even if adults were physically present, there was a lack of social capital if the parents and children lacked a close relationship (Coleman, 1988).

While Abada et al. (2009) identified connections between family structure and educational attainment, Looker and Thiessen (2004) claim that family structure had little influence on educational aspirations, whereas birth order had a somewhat bigger influence on educational aspirations in their research. However, later research found that students from single-parent households were less likely to pursue university education compared to students from two-parent households (Finnie et al., 2005; Gorman-Asal et al., 2021; Shaienks et al., 2008). For example, Finnie et al. (2005) found that 42% of female respondents who lived in a two-parent household went to university compared to 33% of males; 29% of females in a mother-only household went to university compared to 25% of males; 38% of females who lived in a father-only household went to university, compared to 15% of males; lastly, 20% of females who lived in other family environments (i.e. neither parent) went to university compared to 14% of males.

Family Income/household resources (SES)

Studies showed that the higher the socio-economic status of parents, the greater the educational attainment for their children (Andres & Grayson, 2003; Cheung, 2007;

Kamanzi et al., 2009). According to Kamanzi et al. (2009), the rate of university attainment was higher among children whose parents were professionals, managers, and owners of businesses; meanwhile, children of lower socioeconomic backgrounds and those whose parents were in lower income brackets (less than $65,000) or did not attend PSE institutions, were slightly more numerous at the college level.

Geographic Influences

There are various reasons why youths' geographic location may impact their PSE decisions, and many are not influenced by geography alone – in fact, much of the geographic effect on PSE decisions and participation can be explained by sociodemographic, student academic, parental, and aspirational factors (Zarifa et al., 2018). For many students, leaving home to attend PSE is associated with financial strain as the greater the distance to school, the higher the costs of obtaining a PSE (Zarifa et al., 2018). Similarly, leaving home to attend a distant institution can be emotionally taxing, especially for youth who have strong ties and positive family relationships. By moving away from home, students may experience a decrease in positive parent-child relationships (Zarifa et al., 2018).

Provincial

Province of residence had a strong influence on the likelihood that a student had access to all PSE options (Cheung, 2007). In 2004, Looker and Thiessen (2004) noted that Quebec youth were less likely to aspire to attain university education compared to youth from other regions in Canada, as they were more likely to pursue college or CÉGEP education (also see Cheung, 2007; Kamanzi et al., 2009). In 2005, Quebec had

the highest participation rate in college/CÉGEP programs, but still had the lowest university participation rate (Shaienks et al., 2008). That said, Quebec led the country in college participation at 40% (Finnie & Mueller, 2017), which may be explained by the fact that their provincial education system has mandatory college attendance (CÉGEP) for students under 21 years old who intend to pursue university (Finnie & Mueller, 2017; Kamanzi et al., 2009). Finnie et al. (2005) reported that individuals from Nova Scotia (N.S.), Newfoundland, and Ontario had high attendance rates for any PSE, but Saskatchewan and N.S. had the highest university attendance rates. In a separate study using cycles 1-4 of the YITS (Cohort A), Finnie et al. (2015) found that youth who attended an urban high school were considerably more likely to enrol in university than college by age 21.

In 2001, N.S. youth were less likely than British Colombia (B.C.) youth to participate in PSE. However, students in N.S. who did attend were more likely than students in B.C. to earn a university degree (Andres & Looker, 2001). The trend of university attendance continued in 2005, where Newfoundland and Labrador and N.S. had the highest university participation rates, while Alberta had the lowest (Shaienks et al., 2008).

Urban or Rural Location

Research showed that rural students had lower educational expectations and attainment rates than students in urban areas (Andres & Looker, 2001; Andres & Offerhaus, 2012; Finnie et al., 2005; Kirby & Sharpe, 2010; Krahn & Hudson, 2006; Shaienks et al., 2008). Interestingly, Corbett (2013) found that within an isolated

community in Atlantic Canada, PSE (and even secondary education) was historically viewed as a worthwhile investment only for individuals planning to leave the community, while it held little perceived value for those who chose to stay local. In comparing rural and urban youth in N.S. and B.C., Andres and Looker (2001) found that when controlling for gender, academic program, and parental education, rural youth were found to have lower educational expectations. 33% of rural youth in B.C. responded that they expected to obtain some non-university education, compared to 25% from urban/metropolitan areas. In N.S., 35% of rural youth expected to earn a non-university degree compared to 11% of urban youth. Similarly, Kirby and Sharpe (2010) found that in Newfoundland and Labrador, 12.1% of rural students were not planning on attending any PSE; however, of those who did indicate interest in post-secondary, 58.2% expressed interest in non-university education.

There are several important factors that influence rural access to, and students' interest in, attending a PSE as identified in the literature: ease of access/proximity, maintaining rural identity, and cost. Friesen and Purc-Stephenson (2016) found that 71% of 17 rural Alberta youth believed distance between their home and nearest university was a major barrier in accessing PSE. Attending university involved moving 3-8 hours from home where their family, friends, and current jobs were out of reach. 52% of participants said that although there was a community college within commuting distance, there were no courses or programs available that were of interest. Andres and Looker (2001) noted that access to university, either directly by ease of access or through transfer from a community college, had the potential to provide young people in rural areas with new

perspectives of university education as a realistic possibility. In a mixed-methods study of educational decision making in an Atlantic Canadian coastal community, Corbett (2009) found that parents were often torn between following a community pattern of granting youth early exposure to adult activities (e.g. access to fisheries industry) as a way of socializing them into the local methods of wealth accumulation and community development, and protecting them from the same process. This dual environment of risk, reward, and independence was often not offered to girls in the community, whose life trajectories often included an emphasis on engagement with formal schooling to protect them from early engagement in adult activities. Thus, these women had higher levels of formal education and outmigration, as they sought to escape the limited opportunity and access to resources in their coastal community.

Interestingly, Friesen and Purc-Stephenson (2016) found that 'maintaining rural identity' was an important factor influencing decisions to attend PSE. 88% of participants worried they may lose their sense of self by attending university. Some participants worried that by attending university, their rural identity might be stripped away or lost. Perhaps these worries of maintaining a rural identity are partially rooted in those community patterns and expectations of socialization. In addition to these worries and expectations, Corbett (2013) found that many rural youth find it difficult to leave their community to pursue PSE because of pressures to leave and ensure they make the right educational decisions when they do. Historically, rural parents were often reluctant to encourage their children to leave the community and pursue PSE; however, growing insecurities in rural industries and economic uncertainty have prompted many working-

class rural parents to now support their children in pursuing education beyond secondary school, as reflected in Corbett's (2013) research. We believe this is a trend that will continue to evolve within the literature. Our review did not identify any PSE transition research on the rurality of remote Northern communities.

Sex

In 2015, Card and Payne (2015) found a 10% gender gap in university or college registration among Ontario students who performed well in standard grade 9 courses like math, science, language, etc. (69% of females vs. 59% of males). The gap was more pronounced for university (43% for females vs. 32% for males), but not for college. The study also revealed that gender differences in track selection (academic or applied track classes in core subjects) and grades in grade 9 math and language explained 70% of the university registration gap. Another 20-25% was explained by differences in end-of-high school course choices and grades, with high-achieving females being more likely to stay on track and succeed in university-level courses than males. Females who started with lower achievement were better able to get back on track complete high school with enough success in university-level courses than males. Overall, among other conclusions, Card and Payne found that the gap in gender-entry into university was explained by students' choices and outcomes in high school (2015).

Research consistently showed that females were more likely to attend PSE than men. Females also aspired to higher levels of education (university or college) than men (trade/vocational schooling or apprenticeships) (Cheung, 2007; Finnie et al., 2005; Krahn & Hudson, 2006; Shaienks et al., 2008). In 2000, women made up 57% of the university

student body across Canada, which continues to be maintained. From 1992 to present day, women also represented 53-55% of college enrolments (Usher & Balfour, 2023). Gender representation is highly variable across fields of study, with some disciplines essentially "frozen" in time. Figure 2 shows the proportion of male and female PSE graduates by selected fields of study[6] to highlight the differences in program enrolment by gender. The proportions of women and men in the humanities and business, management and public administration have remained relatively consistent over the 3 timepoints. The proportion of women in all other areas has increased, but men consistently have a higher representation than women in mathematics, computer and information sciences and architecture, engineering, and related technologies.

[6] The fields of study in Figure 2 are based on International Standard Classifications of Education (Government of Canada, 2015, p. 9; Table 37-10-0135-02 Proportion of Male and Female Postsecondary Graduates, by Field of Study and International Standard Classification of Education, 2024, p. 37).

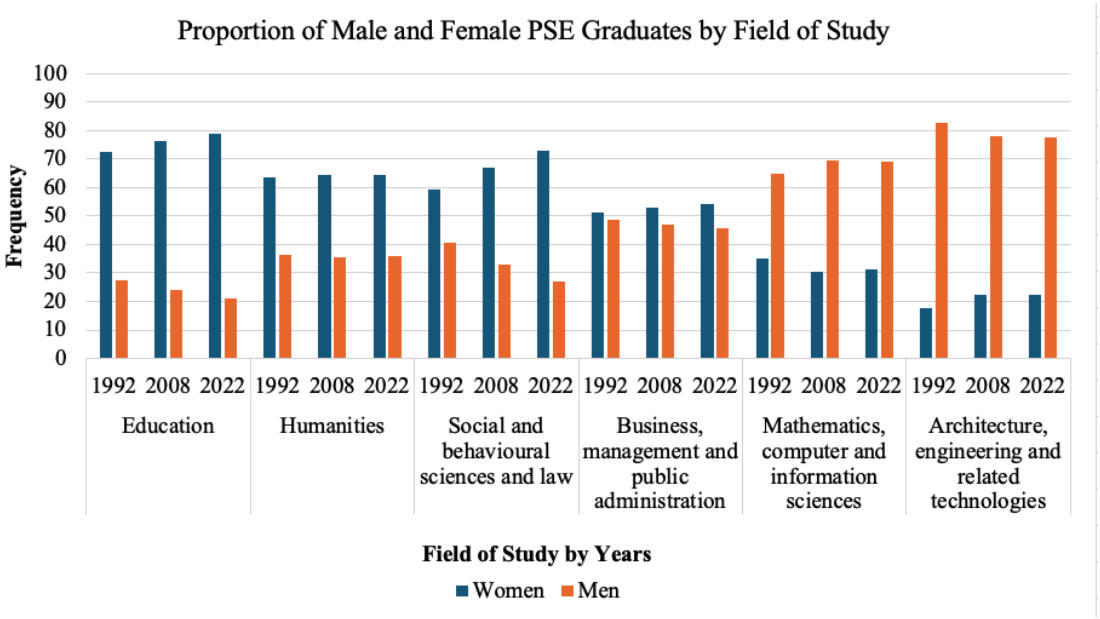

Figure 2. *Graph adapted from Statistics Canada frequency tables (Government of Canada, 2015, p. 9; Table 37-10-0135-02, 2024, p. 37)*

There were also gendered rural and urban differences identified in the research. Andres and Looker (2001) found that in N.S., young women had higher PSE expectations than young men compared to those in B.C.. Young women in N.S. expected to attend university and get degrees beyond the undergraduate level, while young men in the same province expected to attend non-university institutions. In addition, rural youth (both men and women) were more likely to expect to attend non-university programs. In B.C., men in rural areas were more likely than females to go to university, and a higher proportion earned university degrees; that said, women from urban areas were more likely to complete university than men, potentially pointing to the rural/urban differences discussed earlier. In N.S., rural communities are typically closer in proximity to community colleges, unless you are near one of very few rurally situated ("rurally-urban") universities. These findings also support the finding that rural men were more

mobile than rural women (Andres & Looker, 2001). Interestingly, Friesen and Purc-Stephenson(2016) identified gender-role expectations as a contributing factor in PSE attendance, stating 65% of participants agreed that their community had strong gender-role expectations, and that males were typically more encouraged than females to attend university and obtain a degree. This is somewhat contradictory to Corbett's (2009) findings discussed earlier.

School Influences

Grades and Achievement

Grades were proven to be a strong indicator for PSE attendance. Lambert et al. (2001) found that a strong majority of youth with an overall high school average of more than 80% participated in PSE, and few of these youth did not pursue PSE (12%). Of the youth who reported an overall average of 80% or more in high school, close to 60% went to university and 35% went to college or CÉGEP. Of the youth who reported an average of 60% or lower, less than 2% went to university, 12% attended college, and 10% continued to other post-secondary, leaving approximately 75% of students not attending PSE. Thus, the better the academic record in secondary school, the greater odds of attaining PSE.

Some research highlighted gendered differences in academic achievement and grades. In their analysis of the 1991 School Leaver's Survey (SLS) and 1995 Follow-up Survey (SLFS), Finnie et al. (2005) found that girls failed fewer classes than boys, were less likely to skip class, expressed more interest in school, had higher averages and participation rates, and were more likely to get along with teachers. They found girls

received better grades in English, whereas boys did better in Sciences and Math. Overall, females graduating high school with 'A' averages had a 65% university attendance rate, while males with 'A' averages had a 63% university attendance rate. Interestingly, according to Looker and Thiessen (2004), PISA and YITS-A data showed that males were more likely to report failing a grade in Math, Science and Languages. However, the data also showed that of the students who aspired to attain the highest level of education (more than one university degree), both males and females passed these three subjects at equal rates; on the other hand, of those students who aspire to the lowest level of education (less than a high school diploma), females were twice as likely as males to report a passing grade in the three subject areas.

Time spent studying or completing homework was associated with participation rates in PSE (Cheung, 2007; Kamanzi et al., 2009; Shaienks et al., 2008). Young people who spent four or more hours per week on homework were more likely to pursue university education, while those who spent less time on homework typically pursued a college education (Kamanzi et al., 2009). Shaienks et al. (2008) found that university participation rates were twice as high for high school students who spent more than three hours a week studying. While school engagement was only cited in a handful of the literature identified in our systematic review on PSE transitions, we did identify that in all types of PSE, students who reported a higher level of high school engagement were more likely to graduate PSE by age 24-26 (Shaienks et al., 2008). The gap in literature on the relationship between school engagement and PSE attendance could be due to a lack of readily available school data on student engagement variables; thus, we believe the

relationship between school engagement and PSE transitions should be explored further by identifying the various types and sub-categories of engagement (affective/emotional, behavioural, cognitive engagement, etc.) and linking these engagement variables to school data.

Absenteeism

In their descriptive report matching TDSB 2004-2006 Grade 9 Cohorts with PSIS Data, Brown et al. (2021) found that for students who missed 0-2% of classes, two thirds (66.7%) graduated from a Canadian PSE institution, and over half graduated from university. In contrast, they found that most students with over 10% grade 9 absenteeism did not transition into PSE after high school. Brown et al. (2021) used comparative longitudinal cohort data from the TDSB to examine short-term change in the predictors of several possible pathways after high school. Cohort 1 were in Grade 9 in 2005–06 and wrote the Student Census in 2006. Students in Cohort 2 were in Grade 9 in 2010–11 and wrote the Student Census in 2011. They found a negative association between absenteeism and the probability of confirming university or college for both cohorts. Results showed that students Cohort 2 who had high absenteeism rates confirmed college instead of not applying at all at a higher rate than Cohort 1.

Our review did not find detailed explanations on how school policies, practices, and culture affect students' PSE decisions. However, based on our findings across the systematic review do know that: (1) Indigenous students and/or those from rural areas may face additional barriers in school, but some schools and communities offer targeted programs to encourage participation in PSE; (2) school culture can vary, where some may

emphasize university trajectories or have strong extracurricular opportunities and supports to encourage students to consider pursuing higher education; and (3) larger urban schools often have more resources and access to early intervention programs, while smaller rural schools may have limited access to these services, but their small size means they can offer more personalized guidance. These are just a few examples of how school policies, practices, and culture affect students' PSE decisions. Further research is needed to analyze which factors are most influential in shaping PSE decisions.

Race and Ethnicity

Race, ethnicity, and Indigenous identity were highlighted in the literature as predictors of PSE attendance. In the early 2000s and before, Canadian researchers often treated visible minorities as a single population group and found that they were much more likely than others to participate in PSE, particularly in respect to university enrollment (Thiessen, 2009). However, upon investigating student populations in the longitudinal YITS, Thiessen (2009) found that inequalities in the educational pathways of population groups are substantial, thus barriers and facilitative mechanisms must be accounted for in research practice. Among other findings, Thiessen found that African/Latin American youths' nonparticipation is a function of structural disadvantages and academic performance (marks, grade retention, prior dropout, and streaming into non-university-preparatory classes), and that their cultural features decreased the odds of participation in community college and university. He believed that their participation in PSE would be even lower if these youth did not have "culturally protective factors" like high parental aspirations – however, these factors are not a function of their lack of

academic effort or lack of structural supports from parents and peers (2009). Interestingly, while Robson et al. (2018) observed that on average, Black students were less prepared for PSE given their lower grades and higher rates of special education needs (SEN). They found that Black students were more likely than white students to confirm university in 2011, and Southeast Asian students went from being more likely to confirm university than white students in 2006 to showing no difference in 2011.

The new wave of scholars we see today took on this approach of unpacking the "visible minority" grouping which included approaching analyses from an intersectional lens. There were some interesting findings in this systematic review that highlighted the intersections between gender, visible minority status, and place of birth/immigrant status; notably, in terms of college attendance, Finnie et al. (2015) found that male non-visible minority students were more likely to attend college than male visible minorities, regardless of their immigrant status. Female, non-visible minority students born in Canada were the most likely out of all groups to attend college, while visible minorities who either had immigrant status or were born in Canada attended college at a very similar rate, and non-minority immigrants were least likely to attend college. When focusing on university-level education, they found very different results – for both females and males, Canadian-born non-minority students were less likely to attend university than others while visible minorities attended university at a higher rate, regardless of their place of birth/immigrant status (2015).

Robson et al. (2018) identified an interaction between race and gender in their research; there was a significant interaction between the variables 'female' and 'Black' for

confirming university in 2006, but this interaction was not significant in 2011. The gap between the predicted probability for attending university was greater for Black females and Black males than for white females and males, where Black females were one and a half times more likely to confirm university than Black males. There was also a significant interaction between being female and East Asian; East Asian females confirmed university at a similar rate to East Asian males, while white females were more likely to confirm university than white males (Robson et al., 2018). College confirmation differed significantly between Female Middle Eastern and South Asian groups compared to white males, but once the findings were visualized, there was very little difference between the groups (Robson et al., 2018).

Regarding Indigeneity, we only identified one article in 2009 and two in 2010-2019 that aimed to capture Indigenous student's access to PSE in terms of transitions, while Shaienks et al. (2008) discussed post-secondary participation rates of the Indigenous population. The educational pathways of Indigenous youth in Canada are a manifestation of cultural and structural disadvantages (Thiessen, 2009), and thus they experience an education gap that begins in elementary school and continues into higher education (Ottmann, 2017). Their barriers to PSE access include complex admission processes, low awareness of training-related career paths, difficulties relocating to urban environments, and academic preparedness, to name a few (Ottmann, 2017). Thiessen showed that Indigenous youth in the YITS generally had the lowest likelihood of participation in PSE of any kind (2009); using the same dataset, Shaienks et al. found that the PSE participation rate of Indigenous youth was significantly lower than for non-

Indigenous youth (61% versus 81%) (2008). According to the researchers identified in our analysis, supporting successful PSE transitions is a process that should be initiated early in their schooling by fostering positive relationships and sense of belonging within the school environment (Ottmann, 2017; Restoule et al., 2013) and understanding the Indigenous system of transitions (Ottmann, 2017). This lack of research identified in our systematic review highlights the need for more research on the impacts of the Eurocentric education system on Indigenous students' PSE decisions.

Delayed Entry and "No go-ers"

The population of students who delayed entry into PSE were often called "gappers." For Gorman-Asal et al. (2021), gappers were students who pursued PSE between six months to two years after graduation. In 2003, Tomkowicz and Bushnik (2003) reported the highest proportion of gappers in Newfoundland and Labrador, and the smallest proportions in N.S., New Brunswick, Quebec, and Saskatchewan. These students were typically less academically engaged, had lower high school averages, fewer received scholarships and/or awards, fewer had friends immediately transitioning into PSE, and many worked part-time jobs during their last year of high school (Tomkowicz & Bushnik, 2003). Frenette (2022) found that overall, 12.5% of high school graduates who later enrolled in PSE took a gap year of typically 12-15 months; interestingly, the proportion of gappers was greater among men (14.4%) than women (11.1%).

Although the proportion of gappers was small, this phenomenon is important to understand in the grand scheme of the Canadian PSE transition landscape, and it is just as important to understand the proportion of students who do not attend PSE at all. Previous

research found the highest proportion of no-goers in Alberta (highest), Prince Edward Island, Saskatchewan, and B.C. (Cheung, 2007). Cheung (2007) reported that a lower proportion of "no-goers" were from a visible minority and/or had a parent with a university degree, while a higher proportion of these students were males, spoke English as their first language, had less favourable parental influences/parenting structures, they were less academically and/or socially engaged, and worked more hours in a part time job to pay for their senior year of high school.

Robson et al. (2014) found that Special Education Needs (SEN) was an indicator of PSE attendance, identifying that over half of students with SEN (around 60%) in their study did not confirm any PSE pathway, compared to those who did not have SEN (around 30%). The PSE outcomes of students with SEN were influenced by external factors including parental PSE outcomes and neighbourhood incomes. Robson et al. (2014) also identified intersecting identity factors of race and SEN status; 25% of all self-identified Black students in their sample had SEN status and were in applied courses. Self-identified Black students were more likely to confirm college (25%) over university (23%), but the largest outcome was "no PSE confirmation" at a rate of 52% (2014), demonstrating that identifying with SEN and being in the applied stream in school has mixed PSE outcomes for students, with college being the PSE choice for those who do confirm PSE. Having SEN, being in the applied stream, and being Black lowers the probability of college confirmation even further (2014). This leads us to believe that more research needs to be conducted on possible interactions between SEN, achievement and engagement in school, and the impact of these interactions on PSE transitions. This would

help identify ways to make the high school to PSE transition process more accessible to students with various SEN statuses.

Discussion

This article provided a glimpse into the Canadian landscape of PSE transitions. We approached data analysis with a critical lens to uncover gaps in research on PSE transitions. The key findings from our systematic review highlighted the intersectional nature of the factors influencing PSE decisions. For example, gender, race, and socioeconomic status intersect in ways that influences educational decisions and pathways by shaping access to resources, opportunities, and societal expectations. Students from a lower socioeconomic background, for instance, may struggle with financial barriers, while racial minorities may face discrimination within school which can impact their access to impactful supports, resources, opportunities, thus affecting their sense of belonging within school and their access to desired institutions.

In returning to Hossler and Gallagher's model of college choice (Hossler et al., 1999), this systematic review highlights the key impacts of students' predisposition phase (e.g., parents and their expectations, level of education, family income/economic status, race and ethnicity, etc.) which carry over into their search for the desired level and/or type of education they want to pursue. During the transition from the predisposition to search phase, the impacts on students in the former phase interact with the various sub-categories of academic achievement, which further impact the PSE choices available to them and what they ultimately choose to pursue after high school. While we did not identify research on student engagement in our systematic review, we believe it can provide

critical insights into students' post-secondary choices and can be useful for researchers interested in improving students' post-secondary transition experiences (See Audas & Willms, 2002; Li & Xue, 2023; Wong et al., 2024).

K-12 transitions to PSE, and PSE transitions to career pathways, are both increasingly complex processes; as such, students need advanced skills to help them make informed decisions and offer support throughout these transition periods. Student transitions require various interventions to meet the needs of all groups, particularly those who are underrepresented in PSE including youth from low-income communities/households, youth who's parents have no PSE, rural and Indigenous youth, and youth who identify has having a disability (CMEC Reference Framework for Successful Student Transitions, 2017; Deller & Tomas, 2013). Early intervention programs are most impactful when they are tailored to the specific needs of the community and provide youth with resources, supports, and information required to complete high school and transition to PSE (Deller & Tomas, 2013). The Canadian Council of Ministers of Education published a framework for successful student transitions in 2017 that targets these transition periods, offering a wide range of assessment material and indicators for stakeholders – including polocy-makers, social-inclusion supports, career and employment supports, family/guardians, etc. – who are engaged with youth and young adults (CMEC Reference Framework for Successful Student Transitions, 2017). An example of an impactful early-intervention program is Pathways to Education Canada, which offers a range of support services (academics, financial, social, and advocacy) to secondary students; notably, they target youth from

low-income communities to support high school completion or employment transitions (CMEC Reference Framework for Successful Student Transitions, 2017). Our systematic provides an up-to-date snapshot of the factors influencing students' PSE decisions and transitions, and can inform educational policy and intervention practice by highlighting the need for tailored, community-specific early intervention programs that offer comprehensive support across academic, financial, and social domains to help underrepresented youth successfully navigate the transition to post-secondary education and career pathways.

We identified several gaps in the literature. First, themes of absenteeism, SEN, family type/structure, commitment/ engagement in studies, and parental expectations and involvement were the least-cited themes in literature on PSE transitions. While the reasoning us unclear, many of these themes are often cited as sub-themes to the larger, more-cited themes. We believe this presents an opportunity for researchers to focus on these themes on a larger scale to understand their impacts on students' PSE decisions. Additionally, an important contribution to the literature would be an analysis of teacher influences on PSE transitions. We know that teachers have a strong effect on students' academic aspirations and success, but we could not identify any research that explored the student-teacher dynamic in influencing PSE transitions.

Future research may also analyze elementary school structures and achievement variables. Model examples for Canadian researchers would be research reports out of the University of Chicago Consortium on School Research (See Allensworth et al., 2014; Malone et al., 2021, for example). Longitudinally linking elementary school structures,

student experience, and achievement variables with that of grade 9 students and future graduation rates would be an important contribution to Canadian literature on student achievment and PSE transitions.

As we see in the literature included in our systematic review, many researchers use large government and provincially controlled datasets which involve lengthy processes to access (Robson, 2021). Longitudinal studies would be effective to track youth trajectories through high school to understand why students leave, but this would require a reintroduction of the YITS and National Longitudinal Survey of Children and Youth (NLSCY). These surveys were discontinued over a decade ago and were the only way to study transitions of youth development on a nationally representative scale (Robson, 2021). There is administrative data from schools, which would provide us with information on students' attendance, grades, suspensions, etc., however, access to this data is highly discretionary, and thus only available to a handful of academic researchers (Robson, 2021). As such, to provide meaningful strategies for supporting PSE transitions based on student needs, school boards should work collaboratively with researchers to effectively utilize relevant, pre-existing data, and allow better access for conducting research in the schools. We suggest that school boards should be more open with their data and have it available to researchers through provincial authorities, or have provinces upload student data they receive from school boards to the ELMLP. There are a few provinces who have extensive information on their secondary students, which includes British Colombia, Québec, Alberta, and Manitoba, several of which have provided some access via Statistics Canada. For example, British Colombia started the *BC Student*

Outcomes Research Forum to oversee the *BC Student Outcomes* program's collection of information from former PSE students (Government of British Columbia, n.d.), and Alberta's *Open Government Program* that provides an extensive list of up-to-date datasets from various government sectors, including education datasets (Alberta Government, n.d.). Both resources are useful for researchers on the provincial level to investigate PSE trends and students' experiences. We suggest that if Ontario and other provinces follow suit, researchers would have the tools to investigate the Canadian landscape of PSE transition and track longitudinal trends, thus supporting provincial implementation of policy changes to suit the needs of future graduating cohorts.

Limitations

While a systematic review is an efficient use of existing literature and helps to identify gaps and avenues for future research, there are several limitations to this method. First, there is a risk of bias in the collection and analysis of data. However, the strict eligibility criteria and systematic nature of data collection process helps to avoid selection bias. Similarly, there is a risk of selective outcome reporting in that the authors may only report a selection of statistically significant outcomes or themes that suit their interests. To avoid selective outcome reporting, we created a table of all themes identified in the literature included in this systematic review so readers can grasp the breadth of the topic while presenting the results in a digestible format. While this review focused on the most common themes in the literature, we hope readers will be inspired to dig deeper into the less-frequently researched themes.

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References

All articles included in the systematic review are identified with an Asterisk (*)

*Abada, T., Hou, F., & Ram, B. (2009). Ethnic Differences in Educational Attainment Among the Children of Canadian Immigrants. *Canadian Journal of Sociology*, *34*(1), 1–29.

*Adamuti-Trache, M., & Andres, L. (2008). Embarking on and Persisting in Scientific Fields of Study: Cultural capital, gender, and curriculum along the science pipeline. *International Journal of Science Education*, *30*(12), 1557–1584. Doi: 10.1080/09500690701324208

Alberta Government. (n.d.). *Open Government Program: OpenData*. Retrieved January 3, 2024, from https://open.alberta.ca/opendata

Allensworth, E., Gwynne, J. A., de la Torre, M., & Moore, P. T. (2014). *Looking Forward to High School and College Middle Grade Indicators of Readiness in Chicago Public Schools*. University of Chicago Consortium on School Research.

*Andres, L., & Adamuti-Trache, M. (2008). Life-course transitions, social class, and gender: A 15-year perspective of the lived lives of Canadian young adults. *Journal of Youth Studies*, Doi: 10.1080/13676260701800753

*Andres, L., & Adamuti-Trache, M. (2009). University attainment, student loans, and adult life course activities: A fifteen year portrait of British Columbia young adults. In R. Finnie, R. Mueller, A. Sweetman, & A. Usher, *Who goes? Who stays? What matters? New empirical evidence on participation in post-secondary education in Canada* (pp. 239–275).

*Andres, L., Adamuti-Trache, M., Yoon, E.-S., Pidgeon, M., & Thomsen, J. P. (2007). Educational Expectations, Parental Social Class, Gender, and Postsecondary Attainment: A 10-Year Perspective. *Youth & Society*, *39*(2), 135–163. Doi: 10.1177/0044118X06296704

*Andres, L., & Grayson, J. P. (2003). Parents, Educational Attainment, Jobs and Satisfaction: What's the Connection? A 10-Year Portrait of Canadian Young Women and Men. *Journal of Youth Studies*, *6*(2), 181–202. https://doi.org/10.1080/1367626032000110309

*Andres, L., & Looker, E. D. (2001). Rurality and Capital: Educational Expectations and Attainments of Rural, Urban/Rural and Metropolitan youth. *Canadian Journal of Higher Education*, *31*(2), 1–45. https://doi.org/10.47678/cjhe.v31i2.183387

*Andres, L., & Offerhaus, J. (2012). *The mosaic of post-secondary institutional attendance: A twenty-two year perspective*. BC Council on Admissions and Transfer.

Apple, M. (1979). *Ideology and Curriculum*. Routledge Falmer.

*Areepattamannil, S., & Lee, D. H. L. (2014). Linking Immigrant Parents' Educational Expectations and Aspirations to Their Children's School Performance. *The Journal of Genetic Psychology*, *175*(1), 51–57.

Audas, R., & Willms, J. D. (2002). *Engagement and Dropping Out of School: A Life-Course Perspective* (MP32-28/01-1-10E-IN). Human Resources Development Canada.

Bourdieu, P., & Passeron, J.-C. (1990). *Reproduction in Education, Society and Culture*.

Sage Publications.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, *11*(4), 589–597. https://doi.org/10.1080/2159676X.2019.1628806

*Brown, R. S., Walters, D., Parekh, G., & Conley, C. (2021). *Overall Patterns: Match Of The TDSB 2004-2006 Grade 9 Cohorts With PSIS Data* [Descriptive Report]. Partnership for Student Transitions, Access, and Research on Tertiary Education.

*Card, D., & Payne, A. (2015). *Understanding the Gender Gap in Postsecondary Education Participation The Importance of High School Choices and Outcomes*. Higher Education Quality Council of Ontario. https://heqco.ca/pub/understanding-the-gender-gap-in-postsecondary-education-participation-the-importance-of-high-school-choices-and-outcomes/

*Cheung, S. (2007). *Educational decisions of Canadian youth: A synthesis report on access to postsecondary education*. Higher Education Quality Council of Ontario.

*Childs, S., Finnie, R., & Mueller, R. E. (2010). Family Environment, Family Habits, and Children's Cultural Experiences: Is There a Link to Participation in Post-Secondary Education? In R. Finnie, M. Frenette, R. E. Mueller, & A. Sweetman (Eds.), *Pursuing Higher Education in Canada: Economic, Social, and Policy Dimensions* (pp. 243–267). McGill-Queen's Press.

CMEC Reference Framework for Successful Student Transitions. (2017). Council of Ministers of Education, Canada.

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American*

Journal of Sociology, *94*(Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure), S95–S120.

Collins, R. (1979). *The Credential Society; An Historical Sociology of Education and Stratification*. Academic Press.

*Collins, T., & Magnan, M.-O. (2018). Post-Secondary Pathways among Second-Generation Immigrant Youth of Haitian Origin in Quebec. *Canadian Journal of Education*, *41*(2), 413–440.

*Corbett, M. (2009). No Time to Fool Around with The Wrong Education: Socialisation Frames, Timing and High-Stakes Educational Decision Making in Changing Rural Places. *Rural Society*, *19*(2), 163–177. https://doi.org/10.5172/rsj.19.2.163

*Corbett, M. (2013). I'm going to make sure I'm ready before I leave: The complexity of educational and mobility decision-making in a Canadian coastal community. *Journal of Rural Studies*, *32*, 275–282. https://doi.org/10.1016/j.jrurstud.2013.07.006

de Broucker, P., & Lavallée, L. (1997). *Intergenerational Aspects of Education and Literacy Skills Acquisition*. Statistics Canada and Human Resources Development Canada. https://publications.gc.ca/collections/collection_2017/statcan/CS81-0021-1997-eng.pdf

Deller, F., & Tomas, S. (2013). *Strategies for Supporting Youth Education: A Snapshot of Early Intervention Programs in Ontario*. Higher Education Quality Council of Ontario. https://heqco.ca/pub/strategies-for-supporting-youth-education-a-snapshot-of-early-intervention-programs-in-ontario/

*Drolet, M. (2005). *Participation in Post-secondary Education in Canada: Has the Role Changed over the 1990s?* (Analytical Studies Branch Research Paper Series). Statistics Canada: Business and Labour Market Analysis. https://www150.statcan.gc.ca/n1/en/pub/11f0019m/11f0019m2005243-eng.pdf?st=pBfxUJwg

*Finnie, R., Lascelles, E., & Sweetman, A. (2005). *Who Goes? The Direct and Indirect Effects of Family Background on Access to Post-secondary Education* (11F0019MIE — No. 237). Statistics Canada: Business and Labour Market Analysis.

*Finnie, R., & Mueller, R. (2017). Access to Post-Secondary Education: How does Québec Compare to the Rest of Canada? *L'Actualité Économique*, *93*(3), 441–474. https://doi.org/10.7202/1058428ar

*Finnie, R., & Mueller, R. E. (2007). *The Backgrounds of Canadian Youth and Access to Post-Secondary Education: New Evidence from the Youth in Transition Survey* (A MESA Project Research Paper). Educational Policy Institute.

*Finnie, R., & Mueller, R. E. (2008). *The Effects of Family Income, Parental Education and Other Background Factors on Access to Post-Secondary Education in Canada: Evidence from the YITS* (A MESA Project Research Paper). Educational Policy Institute. http://www.ssrn.com/abstract=2256114

*Finnie, R., & Mueller, R. (2009a). *Access to post-secondary education in Canada among the children of Canadian immigrants* (A MESA Project Research Paper). Educational Policy Institute.

*Finnie, R., & Mueller, R. E. (2009b). They Came, They Saw, They Enrolled: Access to Post-Secondary Education by the Children of Canadian Immigrants. In R. Finnie, M. Frenette, R. E. Mueller, & A. Sweetman (Eds.), *Pursuing Higher Education in Canada: Economic, Social, and Policy Dimensions*. McGill-Queen's University Press.

*Finnie, R., Wismer, A., & Mueller, R. E. (2015). Access and Barriers to Postsecondary Education: Evidence from the Youth in Transition Survey. *The Canadian Journal of Higher Education*, *45*(2), 229–262.

*Frenette, M. (2022). *Is taking a gap year between high school and postsecondary education beneficial or detrimental in the long term?* [Economic and Social Report]. Statistics Canada.

*Friesen, L., & Purc-Stephenson, R. J. (2016). Should I Stay or Should I Go? Perceived Barriers to Pursuing a University Education for Persons in Rural Areas. *The Canadian Journal of Higher Education*, *46*(1), 138–155.

*Gallagher-Mackay, K., & Brown, R. S. (2021). *The Impact of School Closures and Emergency Remote Learning on Postsecondary Transitions in 2020/21: Findings from Toronto*. Higher Education Quality Council of Ontario.

*Gorman-Asal, M., McDonald, T., Miah, P., & Mokhtar, R. (2021). *Student Transition to Post-Secondary Education in New Brunswick: 2014-2019 High School Graduates*. New Brunswick Institute for Research, Data and Training.

Government of British Columbia. (n.d.). *BC Student Outcomes Website*. Government of

British Columbia. Retrieved January 3, 2024, from https://outcomes.bcstats.gov.bc.ca/

Government of Canada, S. C. (2015, November 30). *Table 9 Percentage of women among university graduates, by field of study, Canada, 1992 and 2008*. https://www150.statcan.gc.ca/n1/pub/89-503-x/2010001/article/11542/tbl/tbl009-eng.htm

Government of Canada, S. C. (2024, August 15). *Overview of the Education and Labour Market Longitudinal Platform and Associated Datasets, 2024*. https://www150.statcan.gc.ca/n1/pub/37-20-0001/372000012024002-eng.htm

*Hango, D., Zarifa, D., Pizarro Milian, R., & Seward, B. (2021). Roots and STEMS? Examining field of study choices among northern and rural youth in Canada. *Studies in Higher Education*, *46*(3), 563–593. Doi: 10.1080/03075079.2019.1643308

*Hillier, C., Sano, Y., Pizarro Milian, R., & Zarifa, D. (2023). Where Did They Go? Regional Patterns in Early Transfer in Ontario Post-Secondary Education. *Canadian Journal of Higher Education*, *53*(1), 44–61. Doi: 10.47678/cjhe.v53i1.189927

*Hira-Friesen, P. K., Haan, M., & Krahn, H. (2013). Trades-Related Post-Secondary Educational Attainment among Immigrant and Canadian-Born Young Adults in Alberta. *Alberta Journal of Educational Research*, *59*(1), Article 1. Doi: 10.11575/ajer.v59i1.55644

Hossler, D., Schmit, J., & Vesper, N. (1999). *Going to College. How Social, Economic,*

and Educational Factors Influence the Decisions Students Make. Johns Hopkins University Press, 2715 N.

*Kamanzi, P. C., & Collins, T. (2021). Behind the Exceptional Educational Pathways of Canadian Youth from Immigrant Background: Between Equality and Ethnic Hierarchy [online first]. In E. Guerrero (Ed.), *Effective Elimination of Structural Racism*. IntechOpen.

*Kamanzi, P. C., Doray, P., Murdoch, J., Moulin, S., Comoé, É., Groleau, A., Leroy, C., & Dufresne, F. (2009). *The Influence of Social and Cultural Determinants on Post-Secondary Pathways and Transitions Note 6: Transitions Project* (p. 61). Canada Millennium Scholarship Foundation.

*Kirby, D., & Sharpe, D. (2010). An Examination of Rural Secondary Students' Post-Secondary Education Decisions. *Canadian Journal of Career Development*, *9*(1), 4–14.

*Krahn, H., & Hudson, J. (2006). *Pathways of Alberta youth through the post-secondary system into the labour market: 1996-2003*. Canadian Policy Research Networks Inc. (CPRN).

*Krahn, H., & Taylor, A. (2005). Resilient teenagers: Explaining the high educational aspirations of visible-minority youth in Canada. *Journal of International Migration and Integration / Revue de l'integration et de La Migration Internationale*, *6*(3), 405–434. https://doi.org/10.1007/s12134-005-1020-7

*Krahn, H., & Taylor, A. (2007). *"Streaming" in the 10th grade in four Canadian*

provinces in 2000. (81-004-X20070029994; Education Matters: Insights on Education, Learning and Training in Canada). Statistics Canada.

*Lambert, M., Zeman, K., Allen, M., & Bussière. (2001). *Who pursues postsecondary education, who leaves and why: Results from the Youth in Transition Survey*. Culture, Tourism and the Centre for Education Statistics.

Lareau, A. (1987). Chapter 46: Social-Class Differences in Family-School Relationships: The Importance of Cultural Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 703–717). Oxford University Press.

Li, J., & Xue, E. (2023). Dynamic Interaction between Student Learning Behaviour and Learning Environment: Meta-Analysis of Student Engagement and Its Influencing Factors. *Behavioral Sciences*, *13*(1), 59. https://doi.org/10.3390/bs13010059

*Looker, E. D., & Thiessen, V. (2004). *Aspirations of Canadian youth for higher education* (PISA Publications). Strategic Policy and Planning, Human Resources and Skills Development Canada.

Malone, M., Mahaffie, S., Hernandez, G., Usher, A., & Nagaoka, J. (2021). *The Educational Attainment of Chicago Public Schools Students: 2020*. University of Chicago Consortium on School Research.

McDonough, P. M. (1997). *Choosing Colleges: How Social Class and Schools Structure Opportunity*. SUNY Press.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P.,

& Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*(1). https://doi.org/10.1186/2046-4053-4-1

*Montazer, S., & Wheaton, B. (2011). The Impact of Generation and Country of Origin on the Mental Health of Children of Immigrants. *Journal of Health and Social Behavior*, *52*(1), 23–42.

Newman, M., & Gough, D. (2020). Systematic Reviews in Educational Research: Methodology, Perspectives and Application. In O. Zawacki-Richter, M. Kerres, S. Bedenlier, M. Bond, & K. Buntins (Eds.), *Systematic Reviews in Educational Research: Methodology, Perspectives and Application* (1st ed., pp. 3–22). Springer VS Wiesbaden. https://link-springer-com.libaccess.lib.mcmaster.ca/book/10.1007/978-3-658-27602-7

OECD. (2022). *Secondary graduation rate (Indicator)*. OECD. http://data.oecd.org/students/secondary-graduation-rate.htm

*Ottmann, J. (2017). Canada's Indigenous Peoples' Access to Post-secondary Education: The Spirit of the 'New Buffalo.' In J. Frawley, S. Larkin, & J. A. Smith (Eds.), *Indigenous Pathways, Transitions and Participation in Higher Education* (pp. 95–117). Springer Singapore. https://doi.org/10.1007/978-981-10-4062-7_7

*Rae, J. (2018). *Making the Grade: Immigrant Youth in Post-Secondary Education*. Crime Prevention Ottawa. https://cciottawa.ca/wp-content/uploads/Education-Report.pdf

*Restoule, J.-P., Mashford-Pringle, A., Chacaby, M., Smillie, C., Brunette, C., & Russel,

G. (2013). Supporting Successful Transitions to Post-Secondary Education for Indigenous Students: Lessons from an Institutional Ethnography in Ontario, Canada. *International Indigenous Policy Journal*, *4*(4). https://doi.org/10.18584/iipj.2013.4.4.4

Robson, K. (2021). An Essay on the Challenges of Doing Education Research in Canada. *Journal of Applied Social Science*, *15*(2), 183–196. https://doi.org/10.1177/19367244211003471

*Robson, K., Anisef, P., Brown, R. S., & George, R. (2018). Underrepresented Students and the Transition to Postsecondary Education: Comparing Two Toronto Cohorts. *Canadian Journal of Higher Education*, *48*(1), 39–59. https://doi.org/10.47678/cjhe.v48i1.187972

*Robson, K., Anisef, P., Brown, R. S., & Parekh, G. (2014). The Intersectionality of Postsecondary Pathways: The Case of High School Students with Special Education Needs. *Canadian Review of Sociology*, *51*(3), 193–215. https://doi.org/10.1111/cars.12044

*Robson, K., Pullman, A., Anisef, P., Brown, R. S., & Maier, R. (2021). A multi-level approach to examining food security, race, academic performance, and post-secondary confirmation in a Toronto high school cohort, 2011-2014. *Race Ethnicity and Education*, *24*(1), 56–75. https://doi.org/10.1080/13613324.2019.1631777

*Shaienks, D., Gulszynski, T., & Bayard, J. (2008). *Postsecondary Education –*

Participation and Dropping Out: Differences Across University, College and Other Types of Postsecondary Institutions (81-595-M No. 070). Statistics Canada: Culture, Tourism and the Centre for Education Statistics Division.

*Sheppard, R. (2023). *Understanding Transitions for Disabled Students from Secondary to Post-Secondary Education Using Ecological Systems Theory: A Mixed Methods Approach* [Brock University].

Statistics Canada. (2024). *Table 37-10-0103-01 Participation rate in education, population aged 18 to 34, by age group and type of institution attended* [Dataset]. Government of Canada. https://doi.org/10.25318/3710010301-ENG

*St-Denis, X., & Renée, L. (2022). *The Relative Role of Parental Income and Parental Education in Child Educational Achievement and Socioeconomic Status Attainment: A Decomposition Approach*. FutureSkills Research Lab. http://futureskillscanada.com

Stuart Wells, A., & Serna, I. (1996). Chapter 47: The Politics of Culture: Understanding Local Political Resistance to Detracking in Racially Mixed Schools. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 718–735). Oxford University Press.

*Sweet, R., Anisef, P., & Walters, D. (2010). Immigrant Parents' Investments in Their Children's Post-Secondary Education. *The Canadian Journal of Higher Education*, *40*(3), 59–80.

*Sweet, R., Pullman, A., Adamuti-Trache, M., & Robson, K. (2019). Ethnolinguistic

patterns of degree completion in BC universities: How important are high-school academic achievement and institution of entry? *Canadian Journal of Higher Education*, *49*(3), 69–88.

Table 37-10-0135-02 Proportion of male and female postsecondary graduates, by field of study and International Standard Classification of Education. (2024). [Dataset]. Government of Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710013502

*Thiessen, V. (2009). The Pursuit of Postsecondary Education: A Comparison of First Nations, African, Asian, and European Canadian Youth. *Canadian Review of Sociology/Revue Canadienne de Sociologie*, *46*(1), 5–37. https://doi.org/10.1111/j.1755-618X.2009.01201.x

*Tomkowicz, J., & Bushnik, T. (2003). Who Goes to Post-Secondary Education and When: Pathways Chosen By 20 Year-Olds. *Culture, Tourism and the Centre for Education Statistics - Research Papers*, *2003007*(6), 1–35.

Usher, A., & Balfour, J. (2023). *The State of Postsecondary Education in Canada, 2023*. Higher Education Strategy Associates.

*Vaccaro, A. (2012). An Analysis of Access Barriers to Post-Secondary Education. *College Quarterly*, *15*(4).

Wong, Z. Y., Liem, G. A. D., Chan, M., & Datu, J. A. D. (2024). Student engagement and its association with academic achievement and subjective well-being: A systematic review and meta-analysis. *Journal of Educational Psychology*, *116*(1), 48–75. https://doi.org/10.1037/edu0000833

*Zarifa, D., Hango, D., & Pizarro Milian, R. (2018). Proximity, Prosperity, and Participation: Examining Access to Postsecondary Education among Youth in Canada's Provincial North. *Rural Sociology*, *83*(2), 270–314. https://doi.org/10.1111/ruso.12183

CHAPTER 3

UNDERSTANDING POST-SECONDARY INTENTIONS: INVESTIGATING THE ROLE OF SUPPORT SYSTEMS AND SCHOOL BELONGING AMONG TORONTO STUDENTS

Pulchny, A., & Robson, K. (2025). Understanding Post-Secondary Intentions: Investigating the Role of Support Systems and School Belonging among Toronto Students.

ABSTRACT

Students' perceptions of parental involvement deeply resonate with their academic performance, motivation, and overall satisfaction with life. Using data from the Toronto District School Board (TDSB) Student Census, we investigate factors influencing students' sense of belonging in school and their post-secondary intentions. Multivariate estimations indicate that student belonging indicators generally support students' motivations for continuing to post-secondary education (PSE), but their impact varies according to level of PSE. Findings also indicate that race and gender do not substantially mediate the effect of school belonging on post-secondary intentions in this context. The study also reveals that academic streaming impacts students' school belonging, support, and post-secondary intentions, with their motivations shaped by how they are labeled within the system. This research underscores the critical roles of supportive school and parental structures in fostering students' educational aspirations and overall well-being.

KEYWORDS

Parental involvement, school support, post-secondary intentions, sense of belonging, streaming

Introduction

Amidst the Canadian educational landscape, the complex interplay of school and family support systems emerges as a critical determinant of students' academic success and sense of belonging. Students' perceptions of parental involvement deeply resonate with their academic performance, motivation, and overall satisfaction with life (OECD, 2023). Yet, a gap exists in understanding the nuanced dynamics between sense of belonging, and post-secondary intentions, particularly in Canada. In response to this gap, we employ data from the Toronto District School Board (TDSB) to investigate the impact of school and parental support structures and students' socio-demographic positionality on their sense of belonging and post-secondary intentions. This study is rooted in belongingness theory, which suggests that individuals have a natural and strong need for social belonging, closeness, and interaction with others and are in constant search of long-term interpersonal relationships (Ahmadi, Hassani, & Ahmadi, 2020; Baumeister & Leary, 1995).

As the largest school board in Canada and one of the largest in North America, the TDSB serves approximately 235,000 students across 582 schools, with nearly one-third constituting high school students (TDSB, 2023). As a recognized leader in equitable and inclusive schools, the board has a written mandate to ensure all students and staff feel welcome and accepted in their schools (TDSB, 2024). The TDSB is also the most diverse board in the country (and possibly the world). According to data collected from the TDSB Student and Parent Census in 2017, 28 percent of students are White, 22 percent are South Asian, 14 percent are East Asian, 12 percent are Mixed race, and 11 percent are

Black, with smaller percentages of students identifying as Middle Eastern, Southeast Asian, Latin American, and Indigenous. Almost a quarter of the TDSB student population was born outside of Canada (TDSB, 2023). Considering the TDSB's magnitude and role as a socio-demographically diverse school board that strives to be equitable and inclusive, this makes its student body an ideal focus for this study.

In this paper, we ask three broad questions: (1) What type of school and parental supports can be considered in assessing a student's sense of belonging (henceforth referred to as "school belonging" unless specifically referring to literature), and what impact do these types of belonging have on students' intentions to pursue post-secondary education? (2) Do race and gender mediate the relationship between belongingness and post-secondary intentions? And (3) does academic streaming play a role in students' feelings of belongingness and post-secondary intentions?

Conceptualizing impacts on and indicators of Belongingness and PSE Intentions

To investigate the impact of school and parental support structures and students' socio-demographic positionality on their sense of belonging and post-secondary intentions, we employ a theoretical framework of belongingness theory with cultural and social capital as important components of students' school belonging and post-secondary intentions.

Belongingness and Social Capital Theory

According to belongingness theory, individuals have an innate and strong need for social belonging, closeness, and interaction with others, and are in constant search of long-term interpersonal relationships (Ahmadi et al., 2020; Baumeister & Leary, 1995).

Individuals who lack positive social attachments are more likely to experience both psychological and physical health problems (Baumeister & Leary, 1995). Developing belongingness is particularly important for youth in their formative years, which makes schools – the main location of secondary socialization for most children – a critical environment for this process. Students develop their school belongingness through various interactions, including student-teacher and peer group relationships. Thus, social capital is an important component of students' school belonging.

Capital theory, as developed by Pierre Bourdieu, encompasses a range of resources that individuals can mobilize to gain advantage within their social environment. Bourdieu identified multiple forms of capital, including economic, cultural, and social capital, noting they are interrelated assets that shape a person's position and trajectory within society. Social capital, in particular, refers to actual or potential resources accumulated from social relationships among individuals, families, social networks, etc. (Bourdieu, 1986). Within the social environment, an individual's actions depend on the expectations, norms, and values of others (Dewey, 1966). Unlike other forms of capital, Coleman notes that social capital is fixed in the structure of relations between and among actors (1988). A child gains much of their social capital from their family early in life, which, depending on the level of social capital possessed by their parents, can benefit their future capital accumulation and success, or constrain it (Abada et al., 2009; Coleman, 1988; Taylor and Krahn, 2013). This is particularly pertinent within the school setting as students are expected to respond to the expectations, demands, and norms established by the governing educational bodies.

Cultural capital, on the other hand, consists of cultural outlooks and predispositions developed in the home environment that an individual invests in education, including commonly recognized cultural symbols (behaviours, knowledge, values, and languages, etc.) that signify the dominant class's high status. Cultural capital is a key determinant of students' progress in school (Collins 1979); students who come from higher-status families and possess dominant cultural capital are often viewed as more intelligent and capable of succeeding in school, whereas schools systematically devalue the cultural capital of students who are from lower-class families (Bourdieu and Passeron 1990; Lareau 1987; Mehan 1992). In a society that has a strong emphasis on the importance of academic credentials in obtaining social privileges, schools function to ensure the progression of the dominant state in a discrete fashion (Bourdieu and Passeron 1990; Collins 1979).

Social and cultural capital are important for understanding how the quality of support from teachers, peers, and family members is necessary for students to maintain a positive sense of belonging (Pendergast et al., 2018). The two core relationships we investigate are student-teacher and peer-peer relationships. We then consider the impact of parental factors (including their interactions with the school and their child) on school belonging and post-secondary intentions.

Student-Teacher Relationships

Student-teacher relationships are crucial in fostering a positive school environment (Allen Slaten, Arslan, Roffey, Craig, & Vella-Brodrick, 2021; Ibrahim & El Zaatari, 2020; Pendergast, Allen, McGregor, & Ronksley-Pavia, 2018). Research shows

that schools with strong student-teacher bonds, where teachers understand and support students and their families, see higher student achievement and positive self-image (Cai, Yang, Ge, & Weng, 2023; Dance, 2002; Fine, 1991). Teachers who are approachable, empathetic, and willing to listen build trust, which boosts student success and a sense of belonging (Cai et al., 2023; Ibrahim & El Zaatari, 2020; Pendergast et al., 2018). On the other hand, schools where students report low faculty interest and unfair discipline tend to have higher dropout rates (Fine, 1991). Additionally, students who feel misunderstood often struggle to engage with teachers and face challenges in navigating the school system (Cai et al., 2023; Dance, 2002).

Peer Group Relationships

Positive peer group relationships help to foster supportive and enjoyable school environments, which is associated with academic achievement (Gallard, Barrasa, & Guevara-Viejo, 2016; Wong, Liem, Chan, & Datu, 2024). Peer relationships can release tension, encourage motivation to attend school, and influence students' post-secondary decisions (Ibrahim & El Zaatari, 2020; Tellhed, Bäckström, & Björklund, 2017). Research that investigates school belonging and its connections to school transitions tends to focus on transitions from elementary to high school grades (Gillen-O'Neel & Fuligni, 2013; Pendergast et al., 2018), which leaves limited research available on the impacts of school belonging on transitions from high-school to PSE; as such, this research attempts to fill this literature gap by investigating the impacts of school belonging on PSE intentions.

Beyond a sense of belongingness from these two types of relationships, parental influence is also crucial to students' PSE intentions and decisions. We consider how such involvement impacts students' academic success and PSE intentions, specifically through their level of support and interest in their child's educational choices and communication with teachers.

Influence of Parental Involvement on Students' PSE Intentions

Parental involvement is an important indicator of a student's academic success and post-secondary outcomes (Gao & Ng, 2017; Hillier, 2021; Lareau, 1987). Lareau (1987) found that social class affects how parents engage with their children's education. In a study of two California first-grade classrooms, working-class parents were less involved, viewing education as the teacher's responsibility, while middle-class parents saw it as a partnership and were more engaged. Middle-class families had more time, money, and flexibility to invest in education, and also had higher expectations for their children. This study demonstrates how class-related cultural factors influence parental involvement and students' academic experiences. It also identifies an important and necessary interaction between two types of support systems – school and family – and the impact these interactions have on a student's well-being and success. Similarly, Fine's (1991) study of high school dropouts in New York City revealed that parents sought a reciprocal relationship with schools, while administrators often expected them to support their child's education at home. There was little action to ensure low-income parents and guardians were engaged in the school-family dialogue; the interactions administration had with parents occurred exclusively at school rather than in the communities where students

lived, making it difficult for parents to be engaged because they struggled to secure childcare and transportation.

These studies are examples of the impact of parents' capital on student success and outcomes. However, they do not necessarily provide direct insight into the impacts of parental involvement on students' post-secondary intentions. Little research has been published on this relationship in Canadian literature – that said, recent research out of the United States suggests that parents with some PSE experience tend to increase the odds of their child's PSE enrolment; the positive relationship between parental PSE experience and the child's PSE enrolment does not necessarily stem from their education experience, but rather their involvement in their child's education (Wong et al., 2024). Additionally, we believe there may be a positive correlation between parental PSE and their ability to support and be involved in their child's education. Thus, this article can fill this Canadian research gap in students' post-secondary intentions by looking specifically at the impact of parent-teacher communication on students' PSE intentions.

While it is understood that each type of capital has different characteristics and impacts on student achievement and outcomes, Gao and Ng (2017) propose an "interacting multiple capitals (IMC)" model, which suggests that parental social capital could moderate the effects of cultural and economic capital on entry to university. Cuevas (2023) explores how Latino/a parents' sense of self-efficacy is a determinant factor of supportive behaviours in their children's post-secondary planning, highlighting the barriers they face in this process. Their barriers and limitations stem from deeply rooted histories of school segregation, racial discrimination, cultural exclusion, and language

suppression (2023), which are also reflected in the various forms of capital they use to engage in their child's education and post-secondary planning.

To understand the role of parents in students' development of school belonging and their PSE transition outcomes, we refer to the work of Lareau (2011) and Hillier (2021). Lareau (2011) introduced several concepts to understand styles of parenting, one being *concerted cultivation,* in which parents attempt to cultivate their child's talents and skills by encouraging them to participate or enrolling them in organized activities and extracurriculars. Hillier (2021) calls this a *cultivation ethic* rooted in socioeconomic status (SES) – parents work to provide educational resources in the home and enrol their child in various extracurriculars. For example, Hillier (2021) found that children in higher SES quartiles have more resources, participate in more extracurriculars, and discuss school with parents more often in comparison with children from lower SES quartiles.

Hillier (2021) also proposed an *expressive logic* for understanding the influences of parental involvement on students' academic achievement. In this model, parents become involved in school activities like the school council or events because they want to engage in their child's education. However, this involvement does not directly affect academic performance; rather, it is more about the parents' availability and interest in being involved (Hillier, 2021). In connection with Lareau's work (1987, 2011; Lareau & Horvat, 1999), factors like SES, relationships with teachers, and educational values influence the level of parental involvement. Hillier (2021) also highlights a *realist approach*, where parents react to a child's current accomplishments and adjust their expectations accordingly. For instance, if a child is struggling in school, a parent might

meet more often with teachers to track progress and explore interventions (Hillier, 2021). We argue that combining these approaches can help us understand how parents and teachers influence students' post-secondary intentions.

The Role of Academic Streaming in Students' School Belonging

Also known as "tracking," academic streaming (henceforth referred to as "streaming") is the process of separating students into class groupings based on perceived academic ability and prior achievement, and can happen formally and informally (Brinkmann, Huth-Stöckle, Schunck, & Teltemann, 2024; Legette & Kurtz-Costes, 2021; Maharaj & Zareey, 2022). Streaming can reinforce social inequalities by placing students into rigid tracks based on early assessments, limiting their future opportunities regardless of their potential (Legette & Kurtz-Costes, 2021; Maharaj & Zareey, 2022). Streaming can influence students' educational trajectories, academic identity, social relationships, and school belonging in various ways; notably, streaming becomes a process through which students gather information and develop perceptions about their place in school and what they can and cannot achieve, and can influence their identification and membership with difference social groups (Legette & Kurtz-Costes, 2021; Maharaj & Zareey, 2022).

A key mechanism through which streaming influences students' academic identity and school belonging is their social interactions with teachers and peers (Gillen-O'Neel & Fuligni, 2013; Maharaj & Zareey, 2022). Within the learning environment, teachers and students create strong associations between stream placement and ability, shaping how students perceive their own academic identity and how their teachers treat them (Legette

& Kurtz-Costes, 2021). A student's academic stream can lead to differences in motivational beliefs between groups, particularly in their perceptions of ability, the extent to which they value academic success, and if they value school and learning; for example, students in lower streams may internalize the belief that they are less capable, hindering their motivation and academic growth (Legette & Kurtz-Costes, 2021). As students are placed within different streaming groups, they can model their behaviours, academic motivations and values from those of their peers, which creates group cohesiveness. However, as students develop and internalize conceptions of what it means to belong to different streams, group isolation and bullying are common between streams (Maharaj & Zareey, 2022), which can impact students' school belonging and motivation.

Some argue that the streaming system works to replicate and reinforce social stratification within schools. In Canada, low-income and racialized students are over-represented in lower streams, while higher-income, white students are over-represented within advanced streams (Maharaj & Zareey, 2022; Parek, Killoran, & Crawford, 2011). According to Parekh, Brown, and Abdulkarim (2021), Black students, Indigenous students, disabled students, and other racialized and minoritized groups are significantly disadvantaged within the TDSB streaming system. It's important to note that race is not simply a demographic factor or a social ascription, but is also an indicator of systemic racism within educational institutions. Thus, a critical component of this theoretical analysis is the role of race and other demographic factors in students' access to cultural and social capital, their development of school belonging, and their post-secondary intentions.

Students' Racial Identification

Building supportive relationships – also known "social-capital-accruing experiences" (Strayhorn 2010:309) – can enable racialized students to acquire cultural and social capital that promotes success in their post-secondary endeavors. According to Lareau and Horvat (1999), race moderates the impact of class on one's academic success and experience(s) in school and has an independent theoretical significance in shaping the school-family relationship. They suggest that it is more difficult for Black parents than White parents to conform to institutional standards set by schools, which is primarily White, Eurocentric cultural capital (Lareau & Horvat, 1999; Strayhorn, 2010). Further, schools may be ill-equipped to interact with Black students and their parents on their own terms.

Discrimination is shown to reduce sense of belonging for students of colour, which results in isolation and alienation, thus reducing academic participation and achievement (Hussain & Jones, 2021). Further, parents' social and cultural resources only become forms of capital when they enable parents' obedience to dominant standards in school interactions with teachers and other school bodies (Lareau & Horvat, 1999). We argue that parents' social and cultural resources are forms of capital outside of school, but they only become valuable in the school setting when they align with dominant cultural norms. Each parent passes on unique social and cultural capital, shaped by their racial, ethnic, and cultural background, which plays a key role in their child's development at home. However, if a child's home capital does not align with what is valued in the school, the child may face challenges and mixed messages, making school more difficult than for

students with access to dominant forms of capital. Parents whose cultural capital is not reflected in the school environment may also feel out of place and not receive the respect they deserve when interacting with teachers, principals, or counselors.

Research on post-secondary transitions highlights the role of gender, racialized identity, and immigrant background. Notably, Robson, Anisef, Brown, and George (2018) identified a significant gender-race interaction in university attendance in 2006, with Black females being 1.5 times more likely to attend university than Black males, though this gap disappeared by 2011. They also found that East Asian females were equally likely as East Asian males to attend university, while White females were more likely than White males to do so. It is important to note that race and racism do not operate in the same way for all student groups. For example, while some Asian students may benefit from the "model minority myth," it may act as a "destructive myth" (Li, 2005) for others who may be underachieving compared to their peers, ultimately negatively impacting their self-esteem, well-being, and overall education advancement (Li, 2005; Padgett et.al., 2020). Black and Indigenous students may confront more negative stereotyping from teachers (Riley & Ungerleider, 2012).

While all factors are discussed separately in this paper, they are all strongly interrelated and impact students' educational outcomes in various ways. According to Bowles and Gintis (1976), the school system is an institution that operates to perpetuate the structure of privilege. Upward social mobility requires access to essential opportunities. In an inequitable society, one's access to those opportunities and future outcomes is associated with social, economic, and other conditions (James, 2021). When

viewing schooling and educational attainment as the means to achieve upward mobility, a common attitude of educational institutions is to place the responsibility of success or failure on students, their families and/or parents rather than the educational system itself (James, 2021). The formal and informal processes of the educational system are designed to serve those with pre-established intergenerational advantage; for those who are at a disadvantage compared to others, school processes tend to exacerbate their intergenerational disadvantage. Intergenerational pressures on academic achievement and motivation are important components of the transmission of advantage and disadvantage and are strongly influenced by the classroom environment. As such, it is important to emphasize race in the study of PSE transitions while highlighting the unequal system students must navigate to achieve their goals. The increased likelihood of many racialized students being in non-academic streams in Ontario can produce different pathways that often diminish their educational experiences and outcomes (Galabuzi, 2014).

Hypotheses

Based on the pre-existing literature identified for this research, we developed three hypotheses:

1. The more support and belonging a student experiences, the more likely they will intend to pursue higher levels of PSE.
2. The association between belonging, support, and acceptance and post-secondary intentions will be mediated by students' racial identification and gender. Figure 1 illustrates this relationship.

3. The association between feelings of belonging and acceptance on PSE intentions will be moderated by the interaction of streaming and race. Figure 2 illustrates this relationship.

Figure 1. H2's Mediating relationship between belonging, support and acceptance (X), race and gender (Me), and post-secondary intentions (Y).

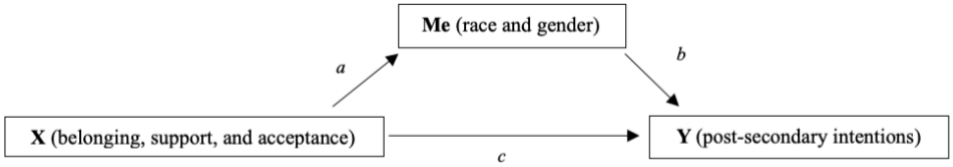
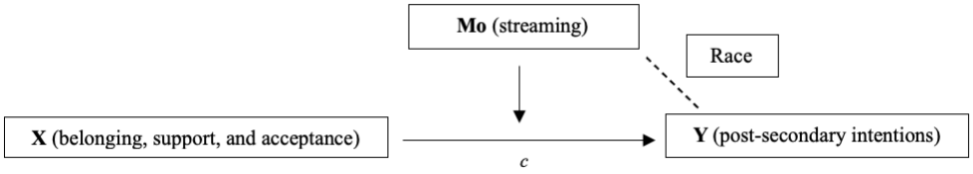


Figure 2. H3's moderating relationship between belonging, support and acceptance (X), streaming and race (Mo), and post-secondary intentions (Y).



Methods

Data

To test the above hypotheses, we analyzed data from the 2016-2017 Toronto District School Board (TDSB) Student Census. The census contains key student socio-demographic information including racial identity, gender, first language, religion, birthplace, etc., parental socio-demographic information including level of education, type of household (single, two-parent, guardian, etc.), employment status, etc., and student experiences in and outside of school. The census data are also merged with administrative data from the school board that are collecting in the course of daily business. The data are structured as four cohorts: 2013, 2014, 2015, and 2016, and each

cohort demarcates when a group of students entered grade 9 and the relevant student census variables from 2016/2017 are matched to each student. The student census is divided into two parts: Part A and Part B. Students who completed the Student Census Part A had different questions from those who completed Census Part B, except for socio-demographic questions and two other substantive questions about relationships to school and experiences in the past year. The variables used for this study were found in both form A and B of the Student Census. After focusing on the variables of interest and removing missing cases, we were left with n=19,948.

Variables

Dependent variables: Post-Secondary Intentions

The dependent variable is students' post-secondary intentions. At first, this variable was coded into seven categories, which we recoded into four: (1) not sure, (2) apprenticeship, work full time, or other plans, (3) College, and (4) University. Originally, the items in the second category were separate values, but as the focus of this paper is postsecondary intentions, we have collapsed them into a single value.

Independent Variables

The independent variables reflect factors that previous literature has identified as critical in understanding PSE pathways of youth in Canada and were available in the data source. They also capture elements of social and cultural capital. For instance, positive relationships between students, families, communities, and teachers – reflected in variables like *care from teachers* and *student acceptance* – illustrate forms of social capital, which support students' sense of belonging and academic success. Similarly,

students whose cultural capital aligns with school values – as measured through *school belonging* – tend to report greater academic engagement and more positive post-secondary intentions, while those who feel disconnected are more likely to disengage. Parental support in students' academic choices, measured through the *parental support* variable, acts as cultural capital, helping students navigate school environments. Additionally, *parental communication with teachers* captures a blend of social and cultural capital, where ongoing dialogue creates a positive feedback loop, aligning the student's home and school cultures and encourages positive outlooks on their academics and belongingness. However, negative parent-teacher interactions can produce conflict, undermining this alignment and diminishing both school belonging and achievement. This study tests whether these variables influence students' post-secondary intentions as anticipated.

The following independent variables are all measured on the same Likert-type scale with the response categories (1) All of the time, (2) Often, (3) Sometimes, (4) Rarely, and (5) Never, which were reverse coded so that the higher numbers were associated with a greater level of feelings.

School belonging is measured by a question that asked, "How do you feel about your school? I feel I belong in this school."

Parental support is measured by a question that asked, "How often do your parents/ caregivers: Support your interests/choices for your school courses?"

Student Acceptance is measured by a question that asked, "How do you feel about your school? I feel accepted by students in my school."

Care from teachers is measured by a question that asked, "How do you feel about your school? My teachers care about me."

Parental communication with teachers is a concept measured by the survey item, "How often do your parents/caregivers: Communicate with your teachers?"

Mediators. A goal in this research was to employ an intersectional approach to examine whether race and/or gender mediated the relationships between school belonging and post-secondary intentions. Thus, we used the variable of *ethno-racial* group, which measures racialized categories through a self-identification item in the Student Census. Students were asked to select only one category that best described their racial identity and were provided with the following options: White, Black, East Asian, South Asian, Southeast Asian, Latin American, Middle Eastern, First Nations, Métis, and/or Inuit, Mixed, and Other. We recoded this variable so that 0=White. Aboriginal and Other accounted for only a handful of cases, so we excluded them from the analysis. *Gender* of student was measured using a variable in which males were coded 0, and females were coded 1. Genders beyond the male/female binary were not considered in the 2016 student census.

Moderators. Another goal of this research was to see if the association between feelings of belonging and acceptance on PSE intentions is moderated by the interaction of streaming and race. Therefore, we include *Academic level*, which is a variable that measures streaming, and was initially coded into four categories which were (1) academic, (2) applied, (3) essentials, and (4) not enough credit levels. We removed the category "not enough credit levels" and recoded the variable into a binary of 0=applied

and essentials and 1=academic. In Ontario, majority academic streams are the primary pathway to university, while applied streams account for more college level PSE transitions.

Control Variables

To account for variables that are known to be factors that can impact PSE intentions, we included the following:

Parental education was initially coded into five categories which were (1) not sure-none-don't know, (2) elementary school, (3) secondary school, (4) college, and (5) university, which we recoded into four: (1) unknown, (2) less than post-secondary, (3) college, (4) university. Like our independent variables, parental education acts as cultural capital by transmitting knowledge, skills, and social norms that influence children's academic and social development. It also functions as economic capital by enhancing parents' ability to provide financial stability, access better opportunities, and create networks that benefit their children's future success.

Grades is a discrete variable that measures the grade nine year one mean mark for all students with values ranging on a scale from 0-100. We left this variable the same for the analysis.

Cohort is a nominal variable that measures the year of the cohort study (i.e. the year that the students began grade nine).

Analytical Approach

To test the hypotheses, we conducted a series of analyses starting with descriptive statistics to understand the general frequency trends in the data, followed by bivariate

tests to compare group differences, and concluded with multinomial logistic regression to assess the relationships between multiple predictors and categorical outcomes.

Multinomial logistic regression was used to model the relationship between support and belonging variables (IVs) and post-secondary intentions (DV), where the post-secondary intentions had more than two categories. This method was chosen because it allows for the assessment of the odds of each category of the dependent variable relative to a reference category.

Results

The results section is broken down into several sections: descriptive statistics, ANOVA and t-tests of significance, and multinomial logistic regressions.

Descriptive Statistics

Table 1 presents descriptive statistics for the sample of TDSB Student Census results. According to the descriptive analysis, 72 percent of the sample intend to pursue university, while 13 percent intend to pursue college, and 10 percent were not sure.

In this sample, the largest racial identification group is White (29 percent), followed by South Asian (23 percent), East Asian (15 percent), and Black (11 percent). Latin American students are the least represented in this sample (2 percent) with Southeast Asian (5 percent) and Middle Eastern (5 percent) not far behind. In terms of the sample distribution for gender, it is an almost even split between females and males (50 percent).

A total of 39 percent of respondents felt school belonging often, which is the most common response in the sample. Only 24 percent of respondents felt school belonging all

the time, and 25 percent felt school belonging sometimes; while 8 percent rarely felt school belonging, and 4 percent never do. Student acceptance is like school belonging in that 45 percent often felt accepted by other students, which is the most common response.

Overall, 42 percent of respondents felt like their parent/guardian supports their interests and choices in school, 34 percent often, while 17 percent felt this support sometimes. A very small proportion of respondents rarely or never felt this support. In terms of how often a parent/guardian communicates with teachers, the highest proportion felt that they rarely communicated (31 percent), followed by sometimes (26 percent), and never (24 percent). A small proportion of respondents reported that there was parent-teacher communication often (12 percent) or all the time (7 percent). The high rates of students feeling like their parent(s) never communicate with their teachers indicate initial signs of the barriers some students face in limited parental involvement, which warrants further investigation.

Table 1. Descriptive Statistics From TDSB Student Census

Variable	**Frequency**	**Percent**
Post-Secondary Plans		
Not sure	2,072	10.39%
Apprent., work ft., or other plan	961	4.82%
College	2,615	13.11%
University	14,300	71.69%
School Belonging		
Never	704	3.53%
Rarely	1,630	8.17%
Sometimes	4,953	24.83%
Often	7,793	39.07%
All the time	4,868	24.40%
Student Acceptance		
Never	252	1.26%
Rarely	812	4.07%
Sometimes	3,942	19.76%

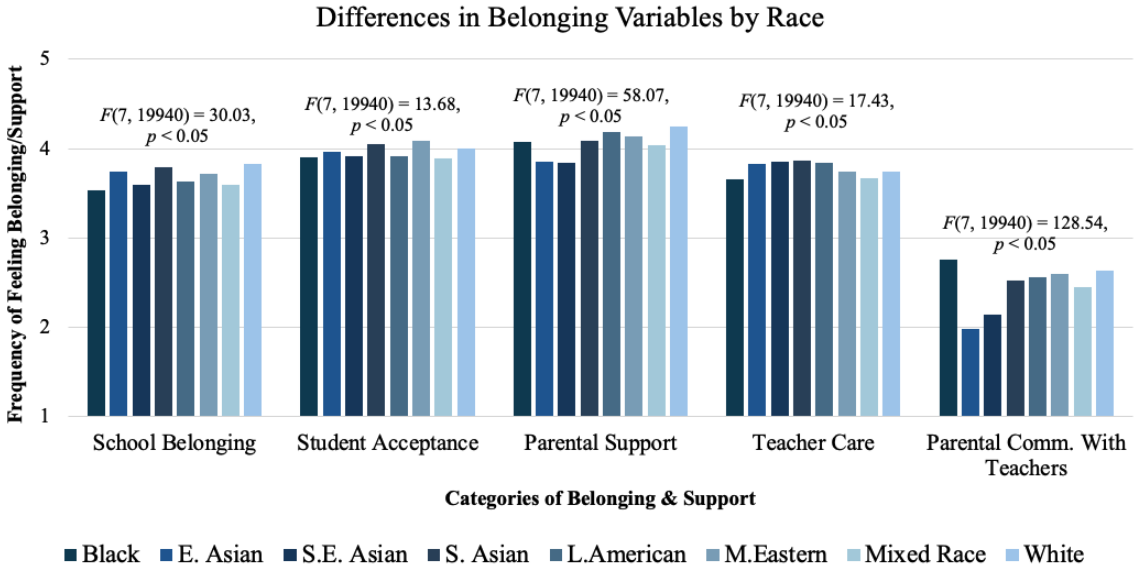
Often	8,937	44.80%
All the time	6,005	30.10%
Parental Support		
Never	399	2.00%
Rarely	1.013	5.08%
Sometimes	3,388	17.01%
Often	6,854	34.36%
All the time	8,294	41.58%
Parental Comm. with Teachers		
Never	4,730	23.71%
Rarely	6,194	31.05%
Sometimes	5,182	25.98%
Often	2,490	12.48%
All the time	1,352	6.78%
Academic Level		
Applied and Essentials	3,157	15.83%
Academic	16,791	84.17%
Racial Identification		
Black	2,141	10.73%
East Asian	2,961	14.84%
Southeast Asian	1,005	5.04%
South Asian	4,561	22.86%
Latin American	341	1.71%
Middle Eastern	1,052	5.27%
Mixed	2,139	10.72%
White	5,748	28.81%
Gender		
Female	9,976	50.01%
Male	9,972	49.99%
Parental Education		
Unknown	2,783	13.95%
Less than PSE	2,596	13.01%
College	3,325	16.67%
University	11,244	56.37%
Cohort		
2013	3,973	19.92%
2014	5,029	25.21%
2015	5,365	26.89%
2016	5,581	27.98%
Total Observations	19,948	------

Differences in level of belonging by Racial Identification and Gender

To examine the differences in levels of support and belonging across racial and gender categories, we utilized bar graphs to visually represent these differences and tests of analysis of variance to test for bivariate statistical significance.

Racial Identification

Figure 3. Differences in Belonging Variables by Race



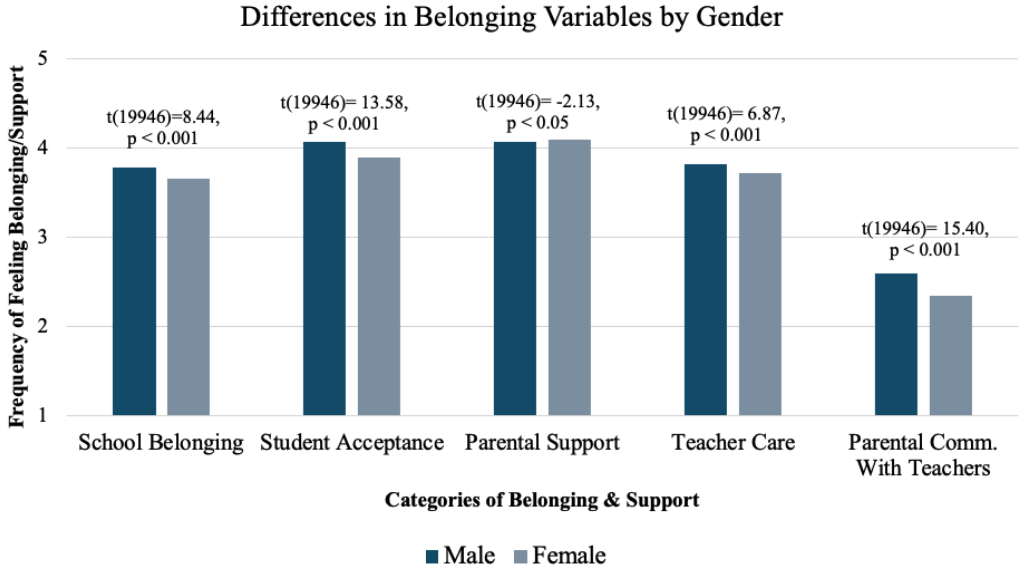
The results of the one-way ANOVAs show significant differences in the belonging variables across racialized groups. The significant differences in each of these areas suggests that racial identification may be influencing students' experiences of school belonging, acceptance, support, teacher care, and parental involvement. For school belonging, all racial groups fall within the same frequency range (3-4, or "sometimes"-"often"); however, White, South Asian, and East Asian students report higher levels of belonging in school compared to the other racial groups. When looking specifically at student acceptance as a form of belonging, Middle Eastern and South Asian students

report higher levels of student acceptance White students report higher levels of parental support in their interest/choices in school courses than others, which is followed closely by Latin American and Middle Eastern students. East Asian and South-East Asian students report the lowest levels of parental support. For feeling teacher care, all racial groups fall within the same range (3-4, or "sometimes"-"often"); however, Black students report the lowest levels of teacher care, and South Asian students report the highest. While Black students feel the lowest levels of teacher care, they report the highest levels of parental communication with teachers[7], and White students report the second highest, although all groups are on the lower end of the scale (2-3, or "rarely"-"sometimes"). East Asian students report the lowest levels of parental communication with teachers, falling within the 0-1 or never range[8]. Thus, these findings warrant further investigation to understand the underlying reasons for these differences.

Gender

Figure 4. Differences in Belonging Variables by Gender

[7] As previously mentioned, Black parents may have to engage in more advocacy to ensure schools effectively serve their children.
[8] According to the realist reaction, it could be that these parents had no concerns (Hillier, 2021).



The results of the t-tests indicate that while gendered differences exist and are statistically significant, they are relatively small across the five components of belonging in school (school belonging, student acceptance, parental support, teacher care, and parental communication with teachers). Male students report the highest levels across all belonging and support categories except for parental support, where females are slightly higher.

Table 2. Multinomial Logistic Regression Model For Post-Secondary Intentions (N=19,948)

	Model 1			Model 2			Model 3			Model 4		
Post-Secondary Intentions *(Base outcome (1): Not sure)*	Apprent./ work ft./ other	College	Uni	Apprent./ work ft./ other	College	Uni	Apprent./ work ft./ other	College	Uni	Apprent./ work ft./ other	College	Uni
Parental Support	1.026	1.142***	1.297***	1.025	1.151***	1.347***	1.025	1.155***	1.338***	1.029	1.157***	1.291***
School Belonging	0.997	1.125**	1.258***	0.998	1.151***	1.291***	1.009	1.163***	1.273***	1.028	1.180***	1.224***
Student Acceptance	1.030	1.011	1.138***	0.972	0.964	1.198***	0.996	0.996	1.151***	0.989	0.989	1.141***
Teacher Care	1.030	1.057	0.997	1.064	1.115**	0.915**	1.033	1.058	0.968	1.064	1.094*	0.947
Parent Involvement – Communication with Teachers	1.189**	1.069**	0.974	1.175***	1.110***	0.988	1.150***	1.068*	1.021	1.112**	1.038	1.076**
Racial Identification *(ref. white)*												
Black	------	------	------	1.296*	2.961***	0.942	1.022	2.152***	2.172***	1.003	2.024***	2.887***
East Asian	------	------	------	0.595**	0.941	2.129***	0.686	1.341	5.908***	0.780*	1.598*	6.156***
South Asian	------	------	------	0.911	2.069***	2.648***	0.948	2.453***	5.648***	0.970	2.474***	6.731***
Southeast Asian	------	------	------	1.078	2.201***	0.943	1.014	1.542*	2.259***	1.141	1.660*	2.348***
Latin American	------	------	------	1.385	1.926***	0.537***	0.871	1.366	1.593	0.845	1.302	1.793
Middle Eastern	------	------	------	1.405	2.274***	1.926***	1.439	2.382***	5.757***	1.420	2.417***	7.279***
Mixed Race	------	------	------	1.169	1.463***	0.787**	1.016	1.536*	1.182	0.972	1.459*	1.361
Gender - Female *(ref. male)*	------	------	------	0.589***	1.142*	1.802***	0.602***	1.188**	1.723***	0.619***	1.222**	1.431***
Parental Education *(ref. not sure)*												
Less than PSE	------	------	------	------	------	------	------	------	------	2.128***	1.793***	1.824***
College	------	------	------	------	------	------	------	------	------	1.669***	2.090***	2.261***
University	------	------	------	------	------	------	------	------	------	1.544***	1.260**	3.295***
Grades (Gr. 9 Year 1 Mean Mark)	------	------	------	------	------	------	------	------	------	0.977***	0.975***	1.046***
Academic Stream *(ref. applied & essentials)*	0.573***	0.357***	5.877***	------	------	------	0.564***	0.396***	10.40***	0.634***	0.491***	5.641***
Interaction Terms												
Black x Academic Stream	------	------	------	------	------	------	1.264	1.302	0.561**	1.148	1.089	0.846
East Asian x Academic Stream	------	------	------	------	------	------	0.869	0.620	0.321***	0.902	0.590*	0.343***
South Asian x Academic Stream	------	------	------	------	------	------	0.957	0.727	0.446***	0.951	0.677	0.501**

Southeast Asian x Academic Stream	------	------	------	------	------	------	0.987	1.670	0.432**	0.990	1.580	0.601
Latin American x Academic Stream	------	------	------	------	------	------	1.999	1.453	0.391*	1.901	1.345	0.536
Middle Eastern x Academic Stream	------	------	------	------	------	------	0.873	0.729	0.339***	0.865	0.661	0.379**
Mixed Race x Academic Stream	------	------	------	------	------	------	1.239	0.874	0.672	1.245	0.823	0.723
Cohort *(ref. 2016)*												
2013	3.470***	4.541***	2.605***	3.501***	4.763**	2.590***	3.473***	4.657***	2.633***	3.424***	4.687***	2.495***
2014	1.701***	2.553***	2.005***	1.706***	2.693***	1.995***	1.679***	2.601***	2.054***	1.682***	2.660***	1.948***
2015	1.367**	1.757***	1.557***	1.378**	1.843***	1.555***	1.357**	1.785***	1.601***	1.366**	1.804***	1.538***
Constant	0.205***	0.318***	0.099***	0.188***	0.078***	0.219***	0.291***	0.163***	0.025***	0.845	0.545*	0.001***
Log Likelihood	-15428.72			-16332.55			-14833.56			-13964.89		
Pseudo R^2	0.127			0.076			0.161			0.210		
Likelihood Ratio	------			-1807.65			1190.32***			2927.65 ***		

Multinomial Logistic Regression

We conducted four multinomial logistic regressions to examine the relationship between several factors that have been shown to be associated with students' school belonging and post-secondary intentions, these analyses aimed to assess how variations in school belonging influence the likelihood of selecting each educational pathway over being uncertain about post-secondary intentions. The second model tests whether the relationship is mediated by race and gender. The bivariate analysis conducted earlier suggested that there are differences in belongingness by race and gender. The multivariate model, however, allows us to account for other factors in the causal pathway so we do not overstate racial and gender differences. The final and third model includes other known factors that are known predictors of PSE attendance so that we do not overstate the associations between our variables of interest and the dependent variable.

In the first model, for each one-unit increase in feelings of parental support, the odds of intending to pursue college are 1.14 times higher, and the odds of intending to pursue university are 1.30 times higher compared to being unsure of their intentions, holding other variables constant. Thus, parental support seems more impactful for those intending to pursue university. For each one-unit increase in feelings of school belonging, the odds of intending to pursue college or university over being 'not sure' see similar increases - the odds of intending to pursue college are 1.13 times higher, and the odds of intending to pursue university are 1.26 times higher compared to being unsure of their intentions, holding other variables constant. Feeling student acceptance was only significant at the university level, where with each one-unit increase, the odds of

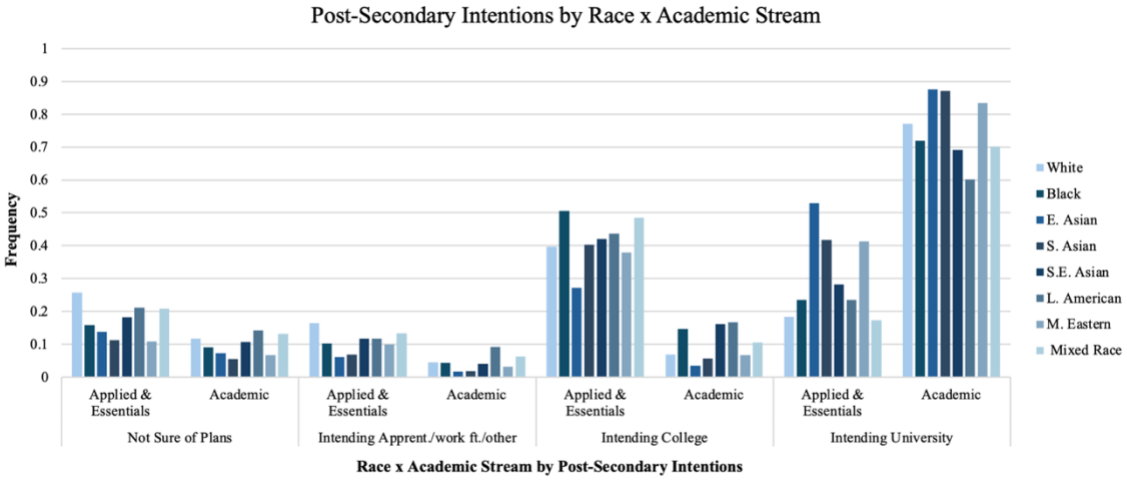
intending to pursue university are 1.14 times higher compared to being unsure of their intentions, holding other variables constant. Feeling cared for by teachers was only significant for those intending to pursue an apprenticeship, work full time, or other plans (1.20) and those intending college (1.07).

Model two, which explores the mediation of race and gender, shows that the inclusion of these variables has minimal impact on the relationship between school belonging and post-secondary intentions, as evidenced by the small increase in odds ratios and relatively consistent significance levels. This suggests that race and gender do not substantially mediate the effect of school belonging variables on post-secondary intentions in this context. However, teacher care and parental communication with teachers become significant with the inclusion of race and gender, but only for those intending to pursue an apprenticeship, work full time, or other plans and those intending to attend college. Teacher care and parental communication with teachers appear to be the most impactful on students who intend to pursue an apprenticeship, work full time, have other plans, or intend to pursue college. The fluctuations in significance and relative risk ratios across all three categories suggest that not all students place the value in (or feel impacted by) the same forms of belonging and support. Thus, it is important to consider whether these findings reflect the differences between independent and dependent learners, and it is worth exploring if the academic streaming system could serve as a conduit through which labeling students and placing them into specific groups ultimately affects their sense of belonging and the support they feel in school. To do this, we introduced interaction terms into the third model to see if there is a relationship between

race and academic stream and if that the relationship impacts post-secondary intentions. We controlled for all belonging and support variables. Figure 5 presents these results in a bar graph.

In model 3, the interaction terms for race and academic stream are significant only at the university level when holding all other variables constant. In this model, several interactions were significant, indicating that the effect of streaming on PSE intentions varied by race. Because it is impossible to eyeball the effects of these interactions given all the other effects in the model, we use a figure to display the marginal effects of the main effects and interaction.

Figure 5. Post-Secondary Intentions by Race x Academic Stream



Overall, Figure 5 presents stark contrasts between applied and essentials and academic streams: students in applied and essentials streams are more likely to intend to pursue an apprenticeship, work full time, have other plans, or attend college. For students who are in applied and essentials and intend to pursue college, approximately 50 percent are Black, 40 percent are White, and 48 percent are Mixed Race. For students who are in

the academic stream and intend to pursue college, Latin Americans are most likely to intend to pursue college (approx. 17 percent). While East Asian students had the overall lowest likelihood of intending to pursue college, they are the most likely to intend to pursue university for both applied and essentials (approx. 54 percent) and academic (97 percent).

In model 4, we introduce control variables for grades and parental education. Several interaction terms at the university level lost significance, while one at the college level gained significance. The inclusion of these controls did not result in major changes to the focal variables of belonging, support, or race. These results suggest that the influence of race and streaming on post-secondary intentions, particularly at the university level, may be somewhat explained by grades and parental education. The significant change at the college level indicates that these control variables could have a stronger impact on college intentions than on university intentions.

According to research conducted on curricular tracking in the United States, honours math placement in grade 6 increased students' sense of belonging; these changes in school belonging were mediated by students' academic identity (i.e. how students perceive themselves in an academic setting) (Legette & Kurtz-Costes, 2021). Thus, we conducted t-tests for analysis of variance and bivariate statistical significance to see if there was a relationship between academic streams and feelings of belonging and support. All t-tests were significant at $p<0.001$ and shows that students in applied and essential streams did indeed receive more support in the form of parental communication with

teachers and teachers. This could be explained by the realist reaction proposed by Hillier (2021). Table 3 presents the results of the t-tests.

Table 3. T-Tests For Differences in Belonging By Academic Stream

	T-Statistic	Mean	
		Applied and Essentials	Academic
School belonging	-9.50***	3.57	3.76
Student Acceptance	-9.67***	3.85	4.01
Parental Support	-4.99***	4.00	4.10
Teacher Care	6.74***	3.88	3.75
Parental Communication with Teachers	12.96***	2.72	2.43

Discussion

The purpose of this study was to examine the types of school and parental supports that can be considered in assessing a students' school belonging, and investigate the impact(s) they have on students' intentions to pursue post-secondary education within the context of the TDSB Student Census.

Firstly, we hypothesized that student belonging variables including parental support, school belonging, student acceptance, care from teachers, and parent-teacher communication support students' motivations for continuing to PSE. The more support and belonging a student receives, the more likely they will be to intend to pursue higher levels of PSE. The multinomial logistic regression models showed that generally, for every unit increase in parental support, school belonging, and student acceptance, the odds of intending to pursue PSE increased. Looking specifically at student acceptance, the results in Model 1 show that the odds of post-secondary intentions are only significant at the university level and show a positive increase. The results also show that students whose parent(s) frequently interact with teachers are more likely to intend to pursue an

apprenticeship, work full time, or have other plans post-graduation. Parental communication with teachers is a form of involvement and thus can be considered a realist reaction, where parents adjust their expectations and engagement according to their child's accomplishments, achievements, etc. (Hillier, 2021). While research has shown that parental academic involvement increases students' educational aspirations (which varies across SES background) (Hill et al., 2004), this is not the case for all students; according to the realist reaction, if a child is struggling in school, parents may be more likely to meet with teachers more often to gauge their progress, provide more help with homework, and engage in school activities more frequently (Hillier, 2021). Parents' increased engagement may not always improve their child's chances of pursuing PSE.

Secondly, we hypothesized that the association between belonging, support, and acceptance and post-secondary intentions would be mediated by students' racial identification and gender. In other words, we thought race and gender would play a role in shaping how students feel belonging and supported, which would in turn influence their post-secondary intentions. In terms of race, using a bar chart and one-way ANOVAs, we found that school belonging, student acceptance, parental support, teacher care, and parental communication with teachers differ between at least some of the racial identification groups, and the observed differences are unlikely to be due to chance.

Using t-tests, we compared the variables of belonging between male and female students. Overall, gender was significantly associated with school belonging, student acceptance, parental support, care from teachers, and parent-teacher communication. While the differences between males and females were relatively small, males had

slightly higher feelings of school belonging, student acceptance, care from teachers, and parental communication with teachers compared to females, while females had slightly higher feelings of parental support compared to males.

Within the multinomial logistic models, the inclusion of race and gender had minimal impact on the relationship between school belonging and post-secondary intentions, suggesting that race and gender do not substantially mediate the effect of school belonging on post-secondary intentions in this context, but they do partially mediate it. That said, our likelihood ratio for the second model is significant at $p < .001$, indicating that the inclusion of these variables somewhat improved the model. In returning to the concept of belonging, we understand that to belong is rooted in a social motive to feel connectedness and acceptance – but under what conditions does this occur? Graham, Kogachi, and Morales-Chicas (2022) note that for racial and ethnic minorities, the size of one's racial/ethnic group within the school setting, and the overall racial/ethnic diversity within the school plays a role in students' construction of belonging; it is an important source of identity affirmation, and can serve as a safe haven for navigating experiences of discrimination and forms of marginalization. We have previously discussed how discrimination is shown to reduce sense of belonging for students of colour, resulting in isolation and alienation, thus reducing academic participation and achievement (Hussain & Jones, 2021). Thus, we conclude that positive sense of school belonging and support are important factors in all students' academic achievement and the construction of their post-secondary intentions, but are particularly important for racial/ethnic minority students.

Thirdly, while Brinkmann et al. (2024) found no effect between streaming and school belonging and found no evidence that tracking exacerbates social inequalities in school belonging, we hypothesized that the association between feelings of belonging and acceptance on PSE intentions would be moderated by the interaction of streaming and race. In other words, we thought that the relationship between belonging and support and post-secondary intentions would operate differently according to students' race and stream, specifically that the effects of streaming on post-secondary intentions might vary by race. The results of the multinomial logistic regression partially support the hypothesis, showing that the relationship between belonging, support, and post-secondary intentions is only slightly moderated by race and streaming, as most variables show minimal changes. However, the significant positive shift in university intentions for most racial groups, except Latin American and Mixed Race students, suggests that race and streaming do interact in influencing post-secondary intentions, though not in the way we initially expected. As explained by Wu and Zumbo (2008), there could be *hidden moderation effects* at play within our data, in that the overall causal effect of this relationship may not be as significant as expected because the causal effect is only true for a small group of the sample.

Our results show that different students are motivated by different types of belonging and nurturing, which can be a conduit of how they have been labelled within the streaming system and ultimately impact their belonging. The post-multivariate t-tests for differences in belonging by academic stream suggested that students in applied and essentials streams need more support in the form of parental communication with teachers

and teacher care. Teacher care and parental communication could be explained by the realist reaction in that teachers and parents are trying to help students who may be struggling academically or in other ways (Hillier, 2021). Interestingly, research shows that teachers' perceptions of students' varying academic abilities can shape both the type and frequency of support they provide, and the students' perceptions of how they are treated by their teachers (Kelly & Carbonaro, 2012; Legette & Kurtz-Costes, 2021). As students who are perceived as more dependent, it makes sense that students in applied and essentials streams feel that they receive more care from their teachers, and their parents communicate with their teachers more to ensure they are on track academically. On the other hand, students in academic streams rely more on school belonging, parental support, and peer acceptance. As more independent learners, there may be more expectations of them succeeding without as much guidance as their lower-streamed peers. Thus, they rely on their parents' arms-length support in their course interests and decisions the support of their peers within the academic stream to keep them motivated and on track. This motivation and support would result in higher levels of school belonging.

Conclusion

This study provides new insights into the role of school and parental support in shaping students' post-secondary intentions, offering a nuanced understanding of how racial and gender factors may contribute to these experiences. It also shows the impacts of academic streaming on students' academic and social motivations, which play an important role in notions of academic ability and post-secondary intentions.

Overall, cultural and social capital, such as parental involvement and school belonging, play a key role in shaping students' motivations for post-secondary education, with parental engagement (particularly through teacher communication) boosting intentions for those who intend to pursue less than a university education. Racial and gender differences further influence how students experience support, with factors like racial group size and school diversity impacting the sense of belonging, especially for racial minorities. Streaming also interacts with these forms of capital, as lower-stream (applied and essentials) students require more direct support from teachers and parents, while academic stream students rely more on peer acceptance and arms-length parental involvement. These dynamics of support and belonging ultimately shape students' academic engagement and post-secondary intentions. We also wish to recognize that although streaming is currently being eliminated in the TDSB, evidence of its stratifying effects is still important to acknowledge.

References

Abada, T., Hou, F., & Ram, B. (2009). Ethnic Differences in Educational Attainment Among the Children of Canadian Immigrants. *Canadian Journal of Sociology*, *34*(1), 1–29.

Ahmadi, S., Hassani, M., & Ahmadi, F. (2020). Student- and school-level factors related to school belongingness among high school students. *International Journal of Adolescence and Youth*, *25*(1), 741–752. https://doi.org/10.1080/02673843.2020.1730200

Allen, K.-A., Slaten, C. D., Arslan, G., Roffey, S., Craig, H., & Vella-Brodrick, D. A.

(2021). School Belonging: The Importance of Student and Teacher Relationships. In M. L. Kern & M. L. Wehmeyer (Eds.), *The Palgrave Handbook of Positive Education* (pp. 525–550). Springer International Publishing. https://doi.org/10.1007/978-3-030-64537-3_21

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Bourdieu, P. (1986). The Forms of Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 46–58). Oxford University Press.

Bourdieu, P., & Passeron, J.-C. (1990). *Reproduction in Education, Society and Culture*. Sage Publications.

Brinkmann, M., Huth-Stöckle, N., Schunck, R., & Teltemann, J. (2024). Tracking and social inequalities in school belonging—A difference-in-differences approach. *Social Science Research*, *124*(103075). https://doi.org/10.1016/j.ssresearch.2024.103075

Cai, Y., Yang, Y., Ge, Q., & Weng, H. (2023). The interplay between teacher empathy, students' sense of school belonging, and learning achievement. *European Journal of Psychology of Education*, *38*(3), 1167–1183. https://doi.org/10.1007/s10212-022-00637-6

Cuevas, S. (2023). From Spectators to Partners: The Role of Self-Efficacy in Latina/o

Immigrant Parents' Engagement in Students' Post-Secondary Planning. *Journal of Latinos and Education*, *22*(1), 271–287. https://doi.org/10.1080/15348431.2020.1747024

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, *94*(Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure), S95–S120.

Collins, R. (1979). *The Credential Society; An Historical Sociology of Education and Stratification*. Academic Press.

Dance, L. J. (2002). *Tough Fronts: The Impact of Street Culture on Schooling*. Routledge Falmer.

Fine, M. (1991). *Framing Dropouts: Notes on the politics of an urban public high school*. State University of New York Press.

Galabuzi, G.-E. (2014). Chapter 5: Race and the Streaming of Ontario's Children and Youth. In D. Clanfield, B. Curtis, G.-E. Galabuzi, A. Gaymes San Vicente, D. W. Livingstone, & H. Smaller, *Restacking the Deck: Streaming by class, race and gender in Ontario Schools* (Vol. 23, pp. 185–225). Canadian Centre for Policy Alternatives.

Gallardo, L. O., Barrasa, A., & Guevara-Viejo, F. (2016). Positive Peer Relationships and Academic Achievement Across Early and Midadolescence. *Social Behavior and Personality*, *44*(10), 1637–1648. https://doi.org/10.2224/sbp.2016.44.10.1637

Gao, F., & Ng, J. C. K. (2017). Studying parental involvement and university access and

choice: An ‘interacting multiple capitals’ model. *British Educational Research Journal*, *43*(6), 1206–1224. https://doi.org/10.1002/berj.3298

Gillen-O’Neel, C., & Fuligni, A. (2013). A Longitudinal Study of School Belonging and Academic Motivation Across High School. *Child Development*, *84*(2), 678–692.

Graham, S., Kogachi, K., & Morales-Chicas, J. (2022). Do I Fit In: Race/Ethnicity and Feelings of Belonging in School. *Educational Psychology Review*, *34*(4), 2015–2042. https://doi.org/10.1007/s10648-022-09709-x

Hill, N. E., Castellino, D. R., Lansford, J. E., Nowlin, P., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2004). Parent Academic Involvement as Related to School Behavior, Achievement, and Aspirations: Demographic Variations Across Adolescence. *Child Development*, *75*(5), 1491–1509. https://doi.org/10.1111/j.1467-8624.2004.00753.x

Hillier, C. (2021). A Seasonal Comparison of the Effectiveness of Parent Engagement on Student Literacy Achievement. *Canadian Journal of Education*, *44*(2), 496–529. https://doi.org/10.53967/cje-rce.v44i2.4551

Hussain, M., & Jones, J. M. (2021). Discrimination, diversity, and sense of belonging: Experiences of students of color. *Journal of Diversity in Higher Education*, *14*(1), 63–71. https://doi.org/10.1037/dhe0000117

Ibrahim, A., & El Zaatari, W. (2020). The teacher–student relationship and adolescents’ sense of school belonging. *International Journal of Adolescence and Youth*, *25*(1), 382–395. https://doi.org/10.1080/02673843.2019.1660998

James, C. E. (2021). *Colour matters: Essays on the experiences, education, and pursuits*

of Black youth. University of Toronto Press.

Kelly, S., & Carbonaro, W. (2012). Curriculum tracking and teacher expectations: Evidence from discrepant course taking models. *Social Psychology of Education*, *15*(3), 271–294. https://doi.org/10.1007/s11218-012-9182-6

Lareau, A. (1987). Chapter 46: Social-Class Differences in Family-School Relationships: The Importance of Cultural Capital. In A. H. Halsey, H. Lauder, P. Brown, & A. S. Wells (Eds.), *Education: Culture, Economy, and Society* (pp. 703–717). Oxford University Press.

Lareau, A. (2011). *Unequal Childhoods: Class, Race, and Family Life, with an update a decade later* (2nd ed.). University of California Press.

Lareau, A., & Horvat, E. M. (1999). Moments of Social Inclusion and Exclusion Race, Class, and Cultural Capital in Family-School Relationships. *Sociology of Education*, *72*(1), 37–53. https://doi.org/10.2307/2673185

Legette, K. B., & Kurtz-Costes, B. (2021). Curricular Tracking, Students' Academic Identity, and School Belonging. *The Journal of Early Adolescence*, *41*(7), 961–981. https://doi.org/10.1177/0272431620977659

Li, G. (2005). Other People's Success: Impact of the "Model Minority" Myth on Underachieving Asian Students in North America. *KEDI Journal of Educational Policy*, *2*(1).

Maharaj, S., & Zareey, S. (2022). The other side of the tracks: How academic streaming impacts student relationships. *Education Policy Analysis Archives*, *30*(118). https://doi.org/10.14507/epaa.30.6905

Mehan, H. (1992). Understanding Inequality in Schools: The Contribution of Interpretive Studies. *Sociology of Education*, *65*(1), 1–20. https://doi.org/10.2307/2112689

OECD. (2023). *Review education policies: Student engagement and motivation*. OECD: Education GPS. https://gpseducation.oecd.org/revieweducationpolicies/#!node=44131&filter=All

Padgett, J. K., Lou, E., Lalonde, R. N., & Sasaki, J. Y. (2020). Too Asian? The model minority stereotype in a Canadian context. *Asian American Journal of Psychology*, *11*(4), 223–232. https://doi.org/10.1037/aap0000203

Parekh, G., Brown, R. S., & Abdulkarim, F. (2021). *Streaming in Education: Thinking beyond Grade 9* [Technical Report]. York University – Toronto District School Board.

Parekh, G., Killoran, I., & Crawford, C. (2011). The Toronto Connection: Poverty, Perceived Ability, and Access to Education Equity. *Canadian Journal of Education / Revue Canadienne de l'éducation*, *34*(3), 249–279.

Pendergast, D., Allen, J., McGregor, G., & Ronksley-Pavia, M. (2018). Engaging Marginalized, "At-Risk" Middle-Level Students: A Focus on the Importance of a Sense of Belonging at School. *Education Sciences*, *8*(3). https://doi.org/10.3390/educsci8030138

Riley, T., & Ungerleider, C. (2012). Self-fulfilling Prophecy: How Teachers' Attributions, Expectations, and Stereotypes Influence the Learning Opportunities Afforded Aboriginal Students. *Canadian Journal of Education / Revue Canadienne de l'éducation*, *35*(2), 303–333.

Robson, K., Anisef, P., Brown, R. S., & George, R. (2018). Underrepresented Students and the Transition to Postsecondary Education: Comparing Two Toronto Cohorts. *Canadian Journal of Higher Education*, *48*(1), 39–59. https://doi.org/10.47678/cjhe.v48i1.187972

Strayhorn, T. L. (2010). When Race and Gender Collide: Social and Cultural Capital's Influence on the Academic Achievement of African American and Latino Males. *The Review of Higher Education*, *33*(3), 307–332. https://doi.org/10.1353/rhe.0.0147

Taylor, A., & Krahn, H. (2013). Living Through Our Children: Exploring the education and career 'choices' of racialized immigrant youth in Canada. *Journal of Youth Studies*, *16*(8), 1000–1021. https://doi.org/10.1080/13676261.2013.772575

Tellhed, U., Bäckström, M., & Björklund, F. (2017). Will I Fit in and Do Well? The Importance of Social Belongingness and Self-Efficacy for Explaining Gender Differences in Interest in STEM and HEED Majors. *Sex Roles*, *77*(1), 86–96. https://doi.org/10.1007/s11199-016-0694-y

Toronto District School Board. (2023). *Toronto District School Board Financial Facts: Revenue & Expenditure Trends*. Toronto District School Board.

Toronto District School Board. (2024). *Toronto District School Board—Equity & Inclusion*. Toronto District School Board. https://www.tdsb.on.ca/Elementary-School/The-Classroom/Equity-Inclusion

Wong, Z. Y., Liem, G. A. D., Chan, M., & Datu, J. A. D. (2024). Student engagement and

its association with academic achievement and subjective well-being: A systematic review and meta-analysis. *Journal of Educational Psychology*, *116*(1), 48–75. https://doi.org/10.1037/edu0000833

Wu, A. D., & Zumbo, B. D. (2008). Understanding and Using Mediators and Moderators. *Social Indicators Research*, *87*(3), 367–392. https://doi.org/10.1007/s11205-007-9143-1

CHAPTER 4

"I HAVE A PLACE HERE": A CASE STUDY OF AN AFTER-SCHOOL STEM PROGRAM FOR UNDERREPRESENTED YOUTH

Pulchny, A., Robson, K., & Zehra, S. (2025). "I have a place here": A Case Study of an After-School STEM Program for Underrepresented Youth.

Abstract

Canada is now a world leader in Science, Technology, Engineering, and Mathematics (STEM) fields, showing a significant increase in STEM education and employment opportunities. However, specific demographics of youth who are underrepresented in STEM education, specifically those from low-income communities who are often racialized face barriers in access to quality educational programs. This article presents a case study of an after-school STEM program for high school students to support successful transitions to post-secondary education (PSE). Our findings show the value of after school programming in supporting underrepresented and at-risk youth in pursuing their PSE goals and developing a sense of belonging and community outside the school setting. We also provide strong insights for other program stakeholders interested in implementing similar programming for Canadian youth. Future research and programming should identify student groups who have yet to be targeted for after-school programming that supports PSE goals and achievement to ensure all Canadian youth have a fair chance of pursuing their goals.

Keywords: After-school programs; STEM; underrepresented youth; inclusion; support systems; belonging; case study

Introduction

As Canada explores innovative and modern practices to sustain and advance their growth, the demand for people with experience in Science, Technology, Engineering, and Mathematics (hereafter STEM) is steadily increasing (Government of Canada, 2021a). Canada has become a world leader in STEM fields, sparking a significant increase in STEM education and employment opportunities. In 2021 Canada had 634,431 graduates from post-secondary education (PSE), nearly a quarter of whom were STEM graduates (Government of Canada, 2023b). In the 2021/22 school year, just over a quarter of PSE students across the country were enrolled in STEM programs[9] (Government of Canada, 2023a). However, youth from low-income communities and those who are racialized are disproportionately underrepresented in STEM education (Anderson et al., 2022; Neally, 2023). Correcting this socioeconomic and racial disparity requires increased youth engagement in STEM education through targeted, accessible[10], and relevant programming to build the soft and hard skills required for further education and employment in these fields. After-school programs (hereafter ASPs) targeted at providing the skills necessary for PSE can fill existing gaps in skill development and support (Baran et al., 2019; Chan, et al., 2020; Duodu, et al., 2017), serving as alternative pathways for youth who lack effective support systems in school and at home.

Research suggests that after-school programming is an effective strategy for reaching youth who are from at-risk or marginalized communities (Christensen, et al.,

[9] These statistics are based on the International Standard Classification of Education and include both Canadian and International students, and all levels of PSE.
[10] Accessibility in this context refers to financial and geographic accessibility, and , accessibly for youth with varying types of disabilities, learning needs, etc.

2023). By understanding the diverse backgrounds of these youth, ASPs can promote an inclusive environment; this involves considering the educational, emotional, physical, and supportive needs of their participants and of their communities. While research seldom articulates the importance of ASPs for youth from at-risk[11] or marginalized communities and the potential for programming to provide support in developing sense of belonging and community outside of the school setting, ASPs are uniquely positioned to connect disengaged youth to their personal and academic interests to support increased motivation and academic achievement.

This case study analyzes the Nexus Program – an intervention strategy that supports successful PSE transitions through an after-school STEM program for youth who are interested in pursuing PSE STEM programs. Nexus was developed and run by the non-profit organization called Mathstronauts in Hamilton, Ontario, Canada. For this case study, we analyzed data collected for the 2023 Nexus Program Report to answer the following questions: What role can after-school PSE preparation programs play in supporting the educational pathways of students pursing STEM education? And what support gaps, if any, do these programs fill?

[11] We use the term "at-risk" youth throughout this article. While there is no single, consistent definition of what makes youth "at-risk," it can consist of youth who are vulnerable or are experiencing adverse outcomes as a result of engaging in or experiencing risk factors, and are thus less likely to successfully transition into adulthood ("Definition of an At Risk Youth," 2021; Salerno, 2023). Risk factors can include (but are not limited to) issues in school and family life, risks within the community, experiencing adverse behaviours both within oneself and from others ("Definition of an At Risk Youth," 2021; Salerno, 2023). Risk factors can be extremely intersectional and multifaceted and can impact a youth's interests in and chances of pursuing PSE.

The findings from this research aided in the improvement of delivering the Nexus program and highlight the role ASPs can play as positive and engaging support systems for students who are typically underrepresented in STEM within PSE. We also provide strong insights for other program stakeholders interested in implementing similar programming for Canadian youth.

Literature Review

Brief history of ASPs in Canada

While there is little research available on the history of ASPs in Canada specifically, researchers have explored the rise of ASPs in North America generally through historical changes in labour movements and developments in schooling. ASPs emerged in the late 19th century when the need for paid child labour to bolster the economy declined and schooling initiatives were growing, particularly with the implementation of compulsory education laws and investments in schooling institutions for children (Halpern, 2002; Mahoney et al., 2009). Over time, there became a distinction between in-school and out-of-school hours; the former spent on learning educational content and adherence to efficiency and strict scheduling, and the latter considered as "discretionary time" during which children could use their time as desired or contribute to the household through domestic responsibilities (Halpern, 2002). Several researchers connect the development of ASPs to the need to fill extra time during out-of-school hours to keep children out of trouble and away from potential dangers they could encounter out in the streets (for an in-depth history on this perspective, see Halpern, 2002; Mahoney et al., 2009). To ensure children were spending their extra time wisely, one solution involved

the development of indoor programs for after-school play, recreation, and informal education. Drop-in ASPs known as "boys clubs" emerged in the late 1800s as a way to occupy boys during typically unsupervised hours. Structured ASPs began to emerge in the early 1900s as developmental supports for working-class families to both supervise children during working hours and to help them build and engage with their social, psychological, and academic abilities (Halpern, 2002; Mahoney et al., 2009).

In 1992, the Government of Canada launched the "Stay in School Initiative" as a mass-mentoring program to tackle increases in high-school dropout rates, specifically targeting youth from low-income, marginalized, and at-risk communities (Hackett & Baran, 1995; Schneider, 1996). The objective was to help motivate young people to finish school, prepare them for the labour market, and create a cooperative relationship between provincial government, schools, businesses, the employment sector, community groups, and families aimed at reducing dropout rates and enhancing the quality of education systems across the country (Hackett & Baran, 1995; Schneider, 1996). Today, ASPs of various types are accessible to youth across the country. In spring 2022, approximately 40% of Canadian students aged 4 to 12 participated in some form of before- or after-school care (Statistics Canada, 2023a)[12].

Benefits of After-School Educational Programs for Youth

ASPs have significant positive impacts on cognitive skills including decision-making, problem-solving, self-regulation, and non-cognitive skills including social skills, and perceived independence, empowerment, and self-confidence (Bulanda & McCrea,

[12] The percentage of students aged 13-18 who participated in after school programs is not available.

2013; Davies & Peltz, 2012; Duodu et al., 2017; Sahin et al., 2014; Wright et al., 2010). ASPs are different from extracurricular programs in that they provide various enrichment activities for youth and emphasize group-oriented projects (Lester et al., 2020). These programs are often run by non-profit organizations, community-based organizations, and schools. Research shows that these programs help students improve their knowledge of transitions to higher levels of education and employment, which includes providing tools for educational, career, and life-planning (Duodu et al., 2017; Jackson, 2013; Li et al., 2020; Lindsay et al., 2016) like soft skills (including note taking, time management, and studying techniques) and hard skills (specific to the program, but could include computer programming for example). Effective ASPs complement the material that students learn during school hours and focus on subjects that may be underemphasized in the classroom (Davies & Peltz, 2012), offering students the opportunity to gain new skills through contextually relevant, relaxed, and inclusive ways. This includes encouraging students to perform tasks to succeed in areas they enjoy, allowing flexibility and enjoyment that motivates them to pursue their goals and endeavours (Sahin et al., 2014). After-school STEM programs, for example, can be effective for cultivating positive attitudes toward STEM education and careers (Baran et al., 2019; Chan et al., 2020; Hoffman et al., 2021). To succeed and reach students who would benefit from this programming, these programs must be accessible financially, geographically, and reflective of various learning needs (Christie et al., 2013; Duodu et al., 2017; Li et al., 2020; Sahin et al., 2014).

While ASPs foster interpersonal competence, promote educational success, and help youth define their life goals (Bulanda & McCrea, 2013; Davies & Peltz, 2012;

Jackson, 2013; Pryce et al., 2019; Wright et al., 2010), they provide more than just academic support; many programs create space for youth to develop sense of belonging with like-minded peers, allowing them to build strong peer relationships and develop collaboration and communication skills (Davies & Peltz, 2012; Philp & Gill, 2020; Sahin et al., 2014). Programs targeting at-risk and marginalized youth can play a valuable role in supporting their abilities to cope with life stressors (Bulanda & McCrea, 2013) – research shows that such programs can positively impact the social and academic development of children from low-income and/or high-risk neighbourhoods, as they provide safe and productive use of students' after school hours which keeps them occupied during hours of increased risk (Riggs & Greenberg, 2004). These types of programs often report increased sense of belonging and positive interactions amongst their youth, which further increases their level of engagement, motivation, resilience, and content-retention (Davies & Peltz, 2012; Faircloth & Hamm, 2005; Jackson, 2013; Pryce et al., 2019; Wright et al., 2010). For example, in Bulanda and McCrea's (2013) study of African American youths' perspectives on the Stand Up Help Out (SUHO) Program, youth expressed deeper connectedness with each other when participating in SUHO and felt increased motivation to care for their peers and others.

A Glimpse into Mathstronauts and the Nexus Program

Mathstronauts is a federally incorporated non-profit organization founded in 2016 based in Hamilton, Ontario. Hamilton is a city in southeastern Ontario at the western end of Lake Ontario, and is one of Canada's top industrial centers, namely in iron and steel industries ("*Hamilton, Ontario, Canada,"* 2024). In 2021, Hamilton had a population of

569,353, a quarter of whom identified as visible minorities or racialized individuals, and another quarter of whom identified as immigrants (Statistics Canada, 2023b). Despite having a large racialized and immigrant population, Hamilton residents experience high rates of discrimination and racial issues; in a 2021 survey on the extent and context of discrimination experienced by immigrants, visible minorities, and Indigenous Peoples in Hamilton, researchers found that approximately eight out of ten Indigenous Peoples and six out of ten Immigrants and Visible Minorities reported experiencing discrimination in Hamilton in the previous three years compared to five out of ten White Non-Immigrant respondents (Sutter & Esses, 2021).

Mathstronauts develops and delivers inclusive and equitable quality STEM education for middle and high school students (grades 4-12). Using a multidisciplinary project-based learning approach (PjBL), the organization's mission is to remove barriers to STEM education to empower young people to develop STEM skills focused on digital literacy and coding. While diverse in their structure, all programs aim to engage youth in STEM and provide youth with access to real-life STEM mentors. Mathstronauts programs complement students' school curriculum with fun and interactive hands-on projects in an effective way to demonstrate that engineering and science have real-world applications[13]. In 2020, Mathstronauts partnered with the McMaster Research Shop to conduct a needs assessment and environmental scan of existing STEM programs that are available to high school students in the Hamilton area (Li et al., 2020). Li et al. conducted surveys with high school students in STEM programs, parents of high school students, first year PSE

[13] For more information on Mathstronauts' background and offerings, visit https://mathstronauts.ca/.

students in STEM programs, and interviewed professors who teach first-year STEM courses. Their study found that while many first-year PSE students believed their high school prepared them for PSE, they struggled in areas of math, coding, scientific writing, research, and referencing. Further, students expressed difficulties with time and stress management and other interpersonal and soft skills identified as crucial for success in PSE such as focusing, leadership, and studying. The study concluded that there was a need for high school level STEM programming to help bridge the gap between high school and PSE and recommended that Mathstronauts focuses its future programming on technical skills like coding, math and scientific literacy and soft skills like time and stress management and fostering resilience (Li et al., 2020).

Results from Li et al.'s (2020) study were used to inform the development of the Nexus Program, a high school to PSE transition and preparatory program. The Nexus program is designed for high school students who are passionate about STEM and are planning to attend a PSE institution. Nexus bridges the gap between high school and PSE by providing an opportunity for students to acquire the technical and soft skills necessary to succeed in PSE. Throughout the program, students cover modules and complete assignments that help them develop fundamental soft skills that are crucial for success in PSE including time-management, studying effectively and note taking. Data from the program report completed in 2023 was used to inform this case study.

Theoretical Framework

This case study employs a theoretical framework of belongingness theory and intersectionality to analyze the role after-school PSE preparation programs play in

supporting the educational pathways of underrepresented students pursing STEM education, while providing them a place to build positive sense of belonging and community. This involves an explanation of the sociodemographic groups who are underrepresented in STEM education, and the importance of acknowledging their intersectional identities.

Belongingness

Also known as "belongingness," students' sense of belonging in school is positively associated with various educational outcomes including academic performance, increase in motivation, and high-school completion (Ahmadi et al., 2020; Baumeister & Leary, 1995). Developed by Baumeister and Leary (1995), belongingness theory posits that individuals have an advanced and strong need for social belonging and closeness with others and require stable interpersonal relationships that will continue into the near future (Ahmadi et al., 2020; Baumeister & Leary, 1995). Those who lack positive social attachments are more likely to experience both psychological and physical health problems (Baumeister & Leary, 1995). Belongingness is important for children in their most formative years; in terms of belongingness in academic settings, school belongingness plays a substantial role in students' academic outcomes. Research shows that greater sense of belonging is associated with an increase in school participation and academic performance (Anderman & Freeman, 2004; Gandhi et al., 2020; Graham et al., 2023). High school students who are interested in education and career paths that are different from their close peers may reflect on the outcomes of their decisions in terms of social belongingness and other outcome expectations they consider important (Tellhed et

al., 2017). Students may be swayed to choose a path like that of their peers to maintain belonging and connection.

ASPs can serve as a source of belongingness by providing a supportive and inclusive space for students to engage with their interests alongside like-minded peers (Escudé et al., 2020; Hoffman et al., 2021; Paramalingam et al., 2018). For example, in a study of an informal STEM program, Hoffman et al. (2021) found that greater feelings of belonging were associated with greater math and science interest and efficacy.

Intersectionality

Intersectionality is a crucial component of our theoretical analysis, as the sociodemographic identities of our participants are multifaceted and must be acknowledged. Intersectionality is concerned with power and access moderated by the intersection of multiple identities, specifically that some individuals face marginalization based on their sociodemographic identities. The term "intersectionality" has roots in Black feminist activism and was coined in 1989 by American critical legal race scholar Kimberlé Crenshaw. Crenshaw (1991) notes that race and gender are not the only factors that shape individuals' identity and life experiences/outcomes, but that sexuality, ethnicity, nationality, age, and class are also important components of an individual's identity that shape their life experiences.

Sociologist Patricia Hill Collins has immensely contributed to intersectionality studies, seeing it as an interlocking nature of oppression and highlighting the need to investigate how systems of oppression are intertwined and contribute to the marginalization of particular groups (Collins et al., 2021; Davis et al., 2015/2023).

Collins (2019) uses a matrix of domination framework to conceptualize the influence of race, gender, and class in people's lives. This framework emphasizes the importance of history and social structure in understanding how race, gender, and class intersect and manifest in people's lives. The matrix of domination is also used to explain how intersecting systems of power constitute components of political domination – structural arrangements in society result in different systems of advantage and privilege, with those deemed members of "dominant" social groups gaining easier access to advantages and privileges. That said, race, gender, and class impact the experiences of all groups in society (Collins, 2019; Davis et al., 2015/2023).

Within studies of STEM education, intersectionality is uniquely positioned to help researchers understand the complexities of STEM teaching and learning, including the experiences of students in educational settings (Cochran et al., 2020). According to Robson et al. (2018), the term "underrepresented" in education covers "[...]student subgroups whose representation in colleges and universities has been significantly lower than the proportion of their respective populations" (p.40). In STEM, this includes racial and ethnic minorities, females, students with disabilities, and students from low-income homes (Davies & Peltz, 2012; Finnie & Childs, 2018; Hernandez et al., 2013; Kricorian et al., 2020; Prema & Dhand, 2019; Robson et al., 2018; Saj et al., 2018). The underrepresentation of women, racialized youth, persons with disabilities, low-income youth, and ethnic minorities in PSE STEM programs represents the long history of structural racism and inequalities in education which have been reinforced by discriminatory policies, values, beliefs, within higher education (McGee, 2020). It is

equally important to acknowledge that various other factors intersect with students' intersectional identities and thus impact educational pathways and outcomes, which include (but are not limited to) an individual's cultural capital (Adamuti-Trache & Andres, 2008), ethno-linguistic background, high school grades (Sweet et al., 2019), and parents' level of education and expectations (Abada et al., 2009; Areepattamannil & Lee, 2014; Friesen & Purc-Stephenson, 2016). Thus, the incorporation of intersectionality into our research is necessary for unpacking the experiences of our participants, who have multi-faceted and intersectional identities that contribute to their life experiences and perspectives.

We will also use the term "at-risk" youth throughout this article, which fits into our use of underrepresentation within the context of STEM education; while there is no single, consistent definition of what makes youth "at-risk," we can understand it as youth who are vulnerable or are experiencing adverse outcomes as a result of engaging in or experiencing risk factors, and are thus less likely to successfully transition into adulthood ("Definition of an At Risk Youth," 2021; Salerno, 2023). Risk factors can include (but are not limited to) issues in school and family life, risks within the community, and experiencing adverse behaviours both within oneself and from others ("Definition of an At Risk Youth," 2021; Salerno, 2023). Risk factors can be extremely intersectional and multifaceted and can impact a youth's chances of and interests in pursuing PSE and thus can be considered youth who are typically underrepresented within PSE.

The Case Study Method

Case study research is defined as research strategy which investigates a phenomenon in real-world contexts (Priya, 2021). In 1995, Robert Stake grappled with the purpose of case studies in the social sciences and divided them into two main forms: intrinsic (to capture the case in its entirety to understand the bodies that make up the case) and instrumental (focuses on an aspect, concern, or issue of the case) case studies. Instrumental case studies are usually built around an aspect of policy implementation, teaching and learning, or curriculum development (Hamilton & Corbett-Whittier, 2013). Yin (2014) identified that a case study can be (1) *descriptive*, to describe a phenomenon in detail in its real-world context; (2) *explanatory*, in that the study identifies causal factors to explain a certain phenomenon; and (3) *exploratory,* to study a phenomenon to identify new research questions that can be used in future studies (Priya, 2021).

Given these definitions, our case study is instrumental in form by focusing on specific aspects of the Nexus program and takes a longitudinal approach through the collection and analysis of data at various points over a 9-month timeframe. Our case study is a combination of descriptive, explanatory, and exploratory methods in that (a) we provide a *detailed context* about our participants and their demographics, their interests, experiences, barriers they face, and highlight specific benefits of ASPs; (b) our case study *explains* how ASPs impact youth who are underrepresented in STEM, highlighting the relationships between the intervention strategy and the outcomes in supporting PSE goals and sense of belonging; and (c) we identify current gaps in research and present avenues for future studies on the benefits of ASPs for underrepresented and at-risk youth.

Procedures

Ethics approval for this research was obtained through the McMaster Research Ethics Board (MREB # 5790) and the Research Ethics Board of the associated Ontario school board (details excluded to maintain participant confidentiality). Recruitment for participants in the Nexus program commenced once we connected with the participating school board in Ontario to reach out to teachers and administrators at their schools. The administrators and teachers shared the research and program opportunity with their students. Our participant criteria filtered out any applicants who did not meet the "underrepresented" definition explained above. Once a pool of applicants was formed, we gave each applicant a number and randomly selected 23 participants. We then reached out to the chosen participants and their parents/guardians with the consent documents and the required steps for getting started with the research and the Nexus program. We kept in contact with the participants via email throughout the research process. At the beginning of the program, there were two participants who withdrew their participation in the program due to conflicting obligations, leaving a sample of 21 participants. There were also five non-research participants in the program. More information on the participants will be discussed in the following sub-section. To maintain research confidentiality for our research participants, we asked that they not talk about the research during Nexus sessions or with their peers in the program. Although we could not promise their participation in the research would remain anonymous amongst their program peers, we took all necessary steps to ensure confidentiality. Our participants' identities remained anonymous throughout this research and those who are quoted were given pseudonyms.

We used Google Forms to create and distribute surveys to our participants. We chose to use this platform as participants were also using Google platforms within the program. Participants completed three surveys: 1) at the beginning of the program (S1); 2) upon completion of the program (S2), and 3) a follow-up five months after program completion (S3). Our surveys gathered information on demographics, attitudes, and perceptions of STEM, and baseline knowledge of STEM and soft skills. S2 included questions about participants' experiences in the program and increased knowledge of STEM and soft skills. The five-month follow-up survey highlighted the impact of the program on participants' PSE endeavors, their attitudes towards STEM, and their connection to and long-term use of the skills they learned in the Nexus program. The surveys also asked students about their support systems in pursuing STEM. The surveys were designed based on previous program reviews conducted by Mathstronauts, with the addition of several Nexus program-specific questions and several open-ended questions that allowed for sociological critique. Surveys were validated by the academic supervisor of the project, who is an expert in the field, and by the Executive Director of Mathstronauts to ensure the surveys captured what they intended to measure for the program report. In consideration of our short timeline, ethical guidelines, and small participant number, we were unable to use a pilot survey to validate the surveys. We also conducted two virtual focus groups through the Zoom Platform throughout the program, which identified potential areas of improvement, impressions and attitudes surrounding the program, and identified how the participants hope to use their new skills in the future,

both in educational settings and in their personal lives. The first focus group had nine participants, and the second had 11.

Regarding the reliability of our data collection methods, there was little we could do to ensure participant accountability in completing the surveys and participating in the focus groups. Participants could remove themselves from the research at any time without losing their spot in the Nexus program, so the survey response rate and focus group participation was expected to fluctuate. That said, the consistency of several key questions across all three surveys allowed us to identify reliable trends in attitudes about STEM, feelings about and experiences with support systems, and desired post-secondary pathways.

Participants

The research design for the report included analyses and assessments of qualitative and quantitative data collected using surveys and focus groups. We had 21 research participants and 5 non-research participants for a total of 26 program participants. Research participants participated in the program free of cost (usually a $200 value per person), while non-research participants paid the program fee. Table 1 outlines participant demographic characteristics by percentage.

Notably, 72% of participants identified themselves as a visible minority[14], which is defined by the Employment Equity Act (Government of Canada, 2021b) as someone

[14] While our initial recruitment for the Nexus program report aligned with the Government of Canada's official use of the term "visible minority" for consistency during the program, the authors intentionally foreground the terms "racialized" and "racialization" to more accurately reflect participants' lived experiences, social positions, and the social processes through which their identities are constructed and imposed.

who is non-white in race, regardless of their place of birth, and does not identify as an Indigenous person. Further, 5% identified as having Indigenous Status, 10% of participants identified themselves as a person with a disability, 62% identified as female, and 38% identified as male. It is important to note that these identities are intersecting, and participants experience the program very differently from one another depending on their learning needs, home environments, additional personal commitments (e.g. part-time work, caring for siblings, extra time needed for homework, etc.). The Nexus program and our research worked to ensure all students felt they could participate at their desired level without the burden of too much additional work. More on the students' experiences will be discussed in the findings.

Table 1: Participant Demographics (by percentage)

Participant Demographic Characteristics	Percentage of participants
Grade 11	71%
Grade 12	29%
Gender (Female)	62%
Gender (Male)	38%
Identified as a visible minority	72%
Identified as a person with a disability	10%
Indigenous Status	5%

Data analysis

To analyze focus group data, we first transcribed the recordings verbatim, then coded the data into specific themes. Since we were analyzing the data based on specific research questions, we used a mixture of inductive and deductive coding methods (Kennedy & Thornberg, 2018): some codes were derived from the data (for example, *sense of belonging, accessibility, and inclusion)*, while others were predefined and assigned to the data (for example, *STEM skills, soft skills, university preparation, and support systems)*. For this case study, we returned to the survey and focus group data using the same inductive/deductive approach but removed the predefined codes that relate specifically to the format and delivery of the program. According to Proudfoot (2023), combining inductive and deductive thematic analyses can be very versatile within mixed-methods research. To re-analyze this mixed-methods data, we used abductive thematic analysis, which has aspects of both inductive and deductive thematic analysis in that "… the observed phenomenon does not contain an explanation in itself (induction), neither does it constitute a new case of an already known general rule (deduction)" (Vila-Henninger et al., 2022, p. 7). An abductive approach is directed toward theory building as it enriches analysis and cultivates conditions for generative, creative theoretical insights. It is an effective approach for revisiting data with a new perspective and a different theoretical foundation; in other words, it encourages engagement in dialogue between theory-driven and data-driven qualitative analysis (Vila-Henninger et al., 2022). This approach allows us to revisit the data with a sociologically critical lens and a strong theoretical analysis, which was missing from the program report due to its practical nature for education stakeholders and the public.

Table 2: Sample Quote with Coding Method

Results Theme	Related Codes	Example Focus Group Quote (Coded)
Inclusion	Belonging Representation Identity Barriers Community	"Personally I find that [the Nexus Program] helps remind me that I have a place here and it's not that I'm trying to be somewhere where I shouldn't be, that this is something that I've worked on and actually deserve to be a part of it, and I am actually good enough to be a part of it[1]. Because I find that we are all here for the same kind of thing[2]." – Monique Codes: Belonging Representation Community Notes: 1. The program is a testament to their hard work. It's proof that they can pursue their interests and goals. 2. All in the program for the same thing – students with similar goals and interests.
Relationships	Peer relationships Teacher Relationships Family connections Support Adverse relationships Expectations Community	
Place	Safe space Belonging	

For this paper, we focus heavily on the focus group data with a few inclusions of data collected from the surveys, mainly open-ended questions and excluded closed-ended questions. We chose this approach as the inclusion of open-ended responses in a hybrid inductive/deductive thematic analysis are valuable in supporting various data interactions (Proudfoot, 2023). The exclusion of closed-ended survey questions/quantitative data is due to the nature of the questions, the purpose of the surveys[15], and the response rate of

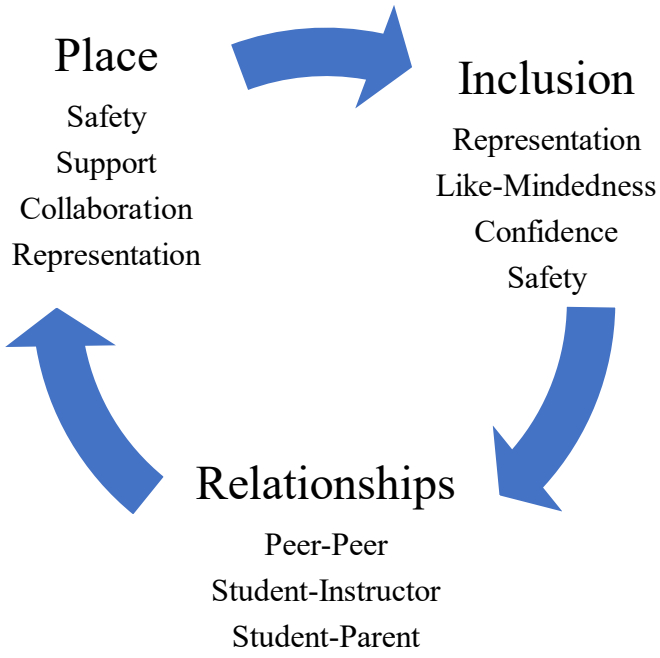
[15] The nature of the survey questions and purpose of the surveys was to collect program-specific data for the non-profit organization. As such, most of this data is not relevant for this paper, except those that cover support systems and sense of belonging. As such, I've chosen to omit a large portion of survey results.

each. The open-ended survey questions were coded using the same methods used for the focus group scripts and while we found strong connections between the responses from each data collection method, we did identify responses that contradicted one another (for example, positive vs. negative experiences with teachers and learning); in such cases, we discussed these differences in the results section.

Results

The results are broken down into three sections: inclusion, relationships, and place. *Inclusion* focuses on embracing identity and developing positive sense of belonging through collaboration and bonding over similar interests and life experiences. *Relationships* focuses on the impact peer-peer, student-instructor, and student-family relationships have on sense of belonging and motivation/passion, and resilience in pursuing STEM in PSE. Finally, *Place* highlights the role of the learning environment in this process which brings together all three sections in a synergistic relationship. All three of these components independently contribute to the development of positive sense of belonging, but when combined create an impactful and cyclical result. Figure 1 presents this cyclical process.

Figure 1: Cycle of Inclusion, Relationships, and Place in Developing Sense of Belonging in the Nexus Program



Inclusion: Embracing Identity Through Belonging and Representation

When discussing what drew them to the Nexus program, focus group participants emphasized the focus on targeting underrepresented and minority groups into the program. For them, they feel it is important to increase representation in STEM to push the field forward and remove the "underrepresented" label by showing PSE institutions and employers that people who are historically underrepresented are interested and can participate in STEM fields like everyone else. Monique explained that although some individuals from underrepresented groups might experience fewer difficulties than others, "…it's really hard, especially for people of color, you know, to thrive in STEM, because I can't stress enough how the environment and community you are in can be very discouraging." She explained that being with a group of like-minded people with similar interests and goals helps to fight discouraging thoughts and proves to herself that she has

a place in STEM. We will talk more about the importance of a supportive environment in the section on *Place*, but it is important to acknowledge the role of ASPs like Nexus in building representation and confidence for historically underrepresented groups.

When asked about the role of the Nexus program in pursuing their PSE goals, participants explained that the program not only helps them stay motivated and provides them necessary skills for entering STEM in PSE, but it serves as a reminder that they are allowed to pursue any goals they set for themselves:

> Personally I find that it helps remind me that I have a place here and it's not that I'm trying to be somewhere where I shouldn't be, that this is something that I've worked on and actually deserve to be a part of it, and I am actually good enough to be a part of it. Because I find that we are all here for the same kind of thing. – Monique.

When schools present discouraging challenges for students, it is important to have the necessary tools and space to confront norms and barriers set in their way. It is also important to have a community of like-minded people to support them in the process.

Relationships

We found that relationships – peer-peer, student-instructor, and student-parent relationships – were an important factor in students' sense of belonging and attitudes toward the program.

In-School Relationships

In the surveys, participants were asked, "How supported do you feel in your desire to pursue STEM?" Most respondents felt supported in their desire to pursue STEM (91%)

and offered detailed insights into what this support looks like. All responses identified family supports and a handful of teachers who provide a satisfactory amount of support, and several noted the benefits of participating in courses related to STEM such as computer classes and physics. Several focus group participants discussed the positive support they receive at school from their peers and teachers who help them stay motivated to pursue their goals despite adversities and barriers:

> I definitely find that I have a lot of issues in [navigating my way through STEM with a visual impairment], um, but since coming to high school I found some really good friends so that even on the days where I can't function very well and I just want to give up, I have them to keep pushing me and saying like, you can do this, I know you want to do this, you are just having an off day, and I find that I have a very strong support team around me and that… Actually, one of the science teachers at my school, he used to be a math teacher, so on the days that I wasn't really understanding math, I would just go to him and he would help explain it to me. – Sasha

Sasha finds that navigating STEM with a visual impairment can be challenging, but she really values the supportive relationships that she has developed with friends and several teachers in her school. However, she has expressed that her high school is not as supportive as it could be but that there are select people in the school who are very supportive. When participants were asked about the ways their schools could be more supportive of students pursuing STEM, Sasha noted further,

> I feel like they need to make it an equal opportunity, and that they need to open more doors because, I know one of my best friends wanted to take grade 11 university biology, but they took applied science last year, because of their mental health, and now they are being told that they can't do that, and they were just going to retake grade 10 science so they could, and they were pretty much told by the guidance counsellor that they're not smart enough for that, and to just not do it.

Here, Sasha explained the experience of a friend who was pushed away from their interests in biology and was swayed in a different direction by their guidance counsellor. This interaction, where they are "not smart enough for that, and to just not do it" can obviously be discouraging and can leave a negative impact on their academic achievement and educational goals. Other participants expressed their thoughts through the surveys, identifying the need for more support from guidance counsellors, more opportunities for financial aid, more representation for women of color, and more accessible classes and resources to help them learn about STEM opportunities.

Interestingly, Sasha brought up the notion that school staff can perpetuate privilege and inequality through uncritical, able-bodied, white perspectives:

> It's not even just the guidance counsellors, but like a lot of the staff need to be more supportive, but also more supportive in an equality way so that if people that are fully abled, white, all that kind of stuff, that everybody could have what they have, because for everybody else that doesn't, we just get pushed down and I feel like that makes it really hard for us to keep going.

This is important to note, as some educators may not possess the skills to be critical of (or even aware of) white privilege and the impact of inequality and structural racism within schools. This can have damaging impacts on students' sense of belonging, well-being, and academic achievement – as Sasha said, this attitude can make it difficult for students to stay motivated and keep going.

Relationships in the Nexus Program

Another type of relationship discussed by participants was the relationships they built in the program with peers. Michael explained that very few of his peers at school know about his immense passion for computer science and other related areas, making the Nexus program a great opportunity to build relationships and work with other students who have interests in the same things. Over time, he found that building these connections allowed him to mature his understanding of his areas of interest and encouraged him to consider varying perspectives both in computer science and lived experiences in pursuing STEM fields that he would not have considered otherwise. So, participating in a program outside of school and regular life that connects students with like-minded peers helped him and other participants feel like a part of a community in which they could pursue their interests and grow in their passions.

Two other important relationships identified by participants were the connections built with the program instructor and teaching assistants. Supportive, engaging, and passionate educators play a crucial role in positive learning environments. The encouraging environment created by the instructor will be discussed in the following section, but it is important to address here the impact of their positive and supportive

demeanor on participant experiences. Our participants expressed that their program instructor always checked in with them at the beginning of each session, creating space for participants to share events going on in their lives and things that might be impacting their mood that day before casually moving into the learning portion of the session. The teaching assistants provided an extra outlet for support during the program by offering space for participants to reach out if they were having difficulties with the program content. Program participants appreciated this support, noting that while the instructor did a great job teaching and supporting them throughout the program, the teaching assistants served as an extra layer of assistance and encouragement.

Participants also had access to a Student Help Desk for additional support. The Student Help Desk is a tool that is integrated in the Nexus program, where participants who need individualized support can submit help requests that were then addressed by program volunteers. This includes support during the program or asynchronous to the online classes. Volunteers provided help on program curriculum, as well as assignments. Although most of our participants did not use the Help Desk during the program, those who did reported it as a useful resource outside of the support received from the program instructor and teaching assistants. However, participants noted that the purpose of the Help Desk could be clearer. In the program report, we recommend strategies to reinforce its purpose, including reminders during Nexus sessions to encourage participants to seek help when needed.

Family Relationships

All participants (both in surveys and focus groups) discussed the importance of family as a crucial support system. Family support is a strong predictor of PSE attendance and strongly impacts the achievement and motivation of students in high school (Cheung, 2007; Childs et al., 2010). Survey respondents highlighted the encouragement and support (financial and emotional) they receive from their family members which helps them feel comfortable sharing their passions and interests with those around them.

One participant explained how community plays an important role in supporting their goals outside of the school and ASP environment:

> I feel supported by my family and community since my family can see that there is a good future in the career I have chosen, and my community shows me examples of that every day with people in the field encouraging me to keep going. (Anonymous survey respondent)

Thus, having access to individuals who can serve as role models and positive examples for students interested in pursuing STEM keep them on the right track and support them throughout their journey.

Place

The Nexus program provides access to STEM education for minority and underrepresented youth who may not have the desired amount of exposure in school. Participants described the Nexus program as a welcoming environment that is motivating, supportive, and collaborative which helps them pursue their STEM and/or PSE goals. Monique explained that the voluntary nature of the program is an important component of what makes it impactful:

> We are all here voluntarily, we all want to be here, and we are all interested in the same thing, you know STEM and engineering and programming, so it is a nice environment to be in and you know, it's a place where you don't feel as judged as in sports for example.

Several participants expressed that the Nexus program encourages them to follow their desired career paths while being surrounded by peers with similar goals. According to Sasha, sharing a program environment with peers who understand her experience with discrimination and barriers she faces in her educational pathway reminds her that she has a place in STEM and encourages her to pursue her goals. She noted,

> Personally I found out about the research thing before I found out about the actual Nexus thing, it's kind of what drew me to it, but specifically that it was for people in minorities, because I found that facing the amount of discrimination that we do, it's a nice way to be able to like, not necessarily get caught up, but go our own path, be around other people that face similar things, so it's no longer that I'm the only one in my class that faces discrimination.

Participants believed that the program instructor created a comfortable environment in which they felt safe sharing their thoughts, experiences, and events going on in their lives that they want to share with people who will listen.

While explaining what attracted her to the program, Sasha elaborated on her perspective on equal access to STEM opportunities and the benefits of learning alongside like-minded peers, stating that Nexus fills an opportunity gap for underrepresented youth:

> I feel like it helps to kind of bring us up to the level that everyone else is at, and it's not because we can't be at that level, but because we don't get the same opportunities, and I also feel like it's really nice, like [Becca] said, we're in a group of people that are going through the same types of things, who understand each other, like on a bit of a different level because even if we are from different backgrounds, we can still understand how hard it is to be so interested in this kind of stuff, with some type of barrier holding us back.

Filling this opportunity gap is important for their academic success, well-being, and sense of belonging. The environment described by participants encourages engagement and hard work through collaboration, understanding, and a community mindset. Some students find that their classroom environments are difficult to focus in and difficult to find motivation to do well, as they are typically surrounded by distractions including peers who "do not want to be there" or lack the same level of interest in and dedication to their education. This program provides a motivating environment for them where they can build their soft and STEM skills.

Discussion

Research suggests that after-school programming is an effective strategy for reaching youth who are from at-risk or marginalized communities (Christensen et al., 2023), in that they can connect disengaged youth to their personal and academic interests to support increased motivation, academic achievement, and resilience[16] in pursuing their

[16] In the context of our research, resilience refers to the ability to adapt, persist, and stay focused on long-term goals.

goals. In our analysis of data collected for the 2023 Nexus Program Report we asked: what role can after-school PSE preparation programs play in supporting the educational pathways of students pursing STEM education? And what support gaps, if any, do these programs fill? We discovered several important findings. First, our participants have multi-faceted and intersectional identities that contributed to their experiences in school and the Nexus program. While some often felt underestimated and/or felt they lacked the school supports necessary for pursuing their STEM goals, the Nexus program filled this gap by understanding the barriers and adversity they may face. Our results show the importance of support systems for students who are typically underrepresented in STEM education and the impact positive and engaging supports can have on their success and sense of belonging. Across all themes identified in our findings, family members were always supportive of our participants' goals and aspirations and ensured they had access to programs like Nexus. Similarly, participants' school and Nexus peers showed unwavering support for one another, which helped them develop positive sense of belonging and attitudes toward their goals and aspirations. Participants emphasized the importance of learning alongside like-minded people in an encouraging and safe environment situated outside of school. Our findings express the importance of building a community mindset and sense of belonging for ASP participants. Although delivered completely online, several participants noted that the Nexus program felt like a community space where they could follow their passion and learn useful skills for their future. Not all students feel a sense of community or belonging within their schools and/or communities, which is why our participants found it important to build community

withing the Nexus program. In engaging in this community space, participants' interests, motivation, and resilience in pursing STEM education were strengthened and even expanded to new ideas and areas not previously considered, and they felt more comfortable implementing their soft skills outside of the program and thus felt more prepared to enter the PSE environment. Indeed, research shows that students tend to maintain interest in STEM when they feel a sense of belonging in their desired field (Hansen et al., 2024).

As shown throughout this research, ASPs can play a vital role in helping youth develop informed and realistic PSE goals by offering structured, engaging activities that expose students to various options for educational and career pathways, and by exposing students to the practical realities of the different PSE routes. For example, ASPs can expose students to diverse career pathways by introducing them to a wide array of careers that are not traditionally "prestigious" careers (e.g. doctors, lawyers, etc.). Bringing professionals into these programs to talk to students could also contribute to their development of social capital. Exposure to various educational and career pathways helps students understand the diverse and exciting opportunities available to them. Within the Nexus program, past program participants, students from local universities and colleges, and parents of program participants who work in STEM fields could be invited to discuss their educational and career pathways, thus providing useful insights and relatable examples for students.

In educational environments – including schools, after-school programs, and other learning settings – students experience a sense of "ownership" through their active

involvement in their education and school community. This ownership is reflected in how they take responsibility for their learning, engage in decision-making, and contribute to shaping their educational experiences. O'Neill (2010) defined youth ownership as a complex, multi-dimensional process that encompasses students' roles as both individuals and learners. O'Neill's research focused on science classes, where youth aspire to be active participants and where the context of their participation plays a critical role. This sense of ownership can manifest in positive self-perceptions related to subjects like science, as well as in their sense of connection to their community and the broader world of work. Additionally, it involves the development of agency through personal growth and contributions to community change (O'Neill, 2010).

The various levels of support identified in our research reflect the beginnings of a wraparound model of support which is identified by researchers as an effective approach to promoting student success and well-being (Bartlett & Freeze, 2018; Yu et al., 2022). A wraparound model is situated in a philosophy of care that focuses on individuals' needs across all relevant areas in their life, advocating for the importance of caring, supportive environments and the use of services and resources that focuses on the individual's needs, strengths, and goals. Schools and services that offer the wraparound approach to student support must be culturally responsive, flexible, comprehensive, and meet students where they are to ensure they remain connected to their family and community (Bartlett & Freeze, 2018; Yu et al., 2022). ASPs (including the Nexus program and others offered by Mathstronauts) fit well within the wraparound model, as they provide an out-of-school and out-of-home support for youth of all socioeconomic backgrounds and can be

particularly impactful for youth in low-income and at-risk communities[17]. As shown through our research, the Nexus program provides a supportive and flexible educational environment that acknowledges and nurtures the individual needs and strengths of participants to help them achieve their PSE and STEM goals. While not yet identified as a complete wraparound model, the Nexus program, and Mathstronauts as a whole, can tailor their program offerings to ensure they preserve community connection and cultural responsiveness.

While STEM and soft-skill education were the focuses of the Nexus program, it is important to highlight the impact of non-profit programs that follow a Science, Technology, Engineering, Arts and Mathematics (STEAM) model of education, which is the integration of arts into STEM subjects. STEAM programs are shown to positively shape students' perseverance and adaptability in education, and encourage character-building skills including curiosity, imagination, oral and written communication, collaboration, and critical thinking and problem solving (Bertrand & Namukasa, 2020). We argue that STEM programs can incorporate art to increase inclusion and accessibility while also targeting the development of the abovementioned students' traits. STEAM can increase accessibility to STEM programming by engaging diverse learning styles and

[17] Compared to higher-income and non-minority families, low-income and minority families face additional barriers in accessing ASPs which include cost, availability of programs, and safe travel options (Kremer et al., 2015). ASPs that focus on reaching low-income youth often encounter issues in staffing, financing, and availability of affordable and accessible facilities (Halpern, 1999). In Budget 2024, the Prime Minister of Canada highlighted financial measures to support after-school learning initiatives that support Indigenous, low-income, and at-risk youth, which included a financial investment in CanCode to support students develop coding and digital skills needed to succeed in STEM (*Giving Every Child the Best Start in Life*, 2024).

making complex ideas and concepts more relatable, further encouraging students to bridge art with science.

Addressing the Needs of Program Participants and Families in the Nexus Program

As the Nexus Program (and Mathstronauts as a whole) stives to provide a safe, inclusive, and representative learning environment for all students interested in STEM fields, the program organizers can adapt to better address the needs of all participants in two key ways: First, the program could introduce curriculum variations that address different cultural backgrounds and learning needs. These could include topics that relate to students' experiences or perspectives specific to their communities. Currently, the program involved learning and applying machine learning (ML) towards a game-design application; this can be adapted to a more culturally relevant project/application (context-specific examples), while retaining the curricular focus on ML. Second, the program could ensure hiring practices take into account placing representative role models in front of students. Representative role models can increase motivation and aspiration, build self-confidence, promote sense of belonging, and provide students with an avenue to gain relevant advice.

Throughout this article, we identified the family as an important support mechanism for students. At present, the Nexus Program does not provide many opportunities for parents to engage with their children and the program throughout their journey. As such, we believe the program could implement a more direct relationship between the program and students' parents from the onset. For example, during intake, they can host an information session so parents are more aware of what will take place

during the program, as well as how the program will benefit their child. This can be expanded into multiple updates throughout the course of the program (e.g., via email or through similar information sessions) where parents receive updates on the program. We also believe the program could organize 1:1 sessions with the program instructor/ coordinator and the students' parents, so that the parent can remain informed about their child's progress throughout the program. This would also give an opportunity to point out and develop a plan for overcoming any unique challenges the student is facing. Finally, to increase representation and family involvement in the program, we believe the program could invite parents who work in STEM fields to visit as guest speakers to share their experiences in their STEM career. This would provide participants with a direct, relatable individual from the sector.

The Challenges of Implementing Community-Based After-School Programming

Duodu et al.'s case study (2017) summarizes the success and challenges of implementing community-based out-of-school STEM programming. Their work focuses on the Visions of Science Network for Learning (VoSNL), which was designed and implemented to address existing barriers experienced my youth residing in low-income communities. VoSNL is a charitable organization in Southern Ontario, Canada, that provides community-based STEM programming to low-income and marginalized youth during out-of-school time. VoSNL programming is delivered directly within the community and is free-of-charge for all youth (Duodu et al., 2017). This case study was one of the first program descriptions and process evaluations of a community-based youth STEM program within Canada (Duodu et al., 2017), and the results can be used as an

example to improve the implementation, delivery, and evaluation of similar community-based STEM (or STEAM) programming for youth.

Duodu et al. (2017) identify several challenges related to the implementation of VoSNL's Community Science Clubs (CSC) including (1) navigating community based issues (compromising situations unfolding in the community that inhibit youth involvement, maintenance or repairs of community buildings used by the program, etc.), (2) limited resources within community locations (access to specific resources and amenities needed for STEM-based workshops) that ultimately inhibited the delivery of curriculum content and development of particular learning modules, and (3) conducting outreach and promotion for CSCs. By providing insights into offering free and accessible programming, overcoming barriers, and demonstrating effective community engagement strategies, VoSNL can serve as a valuable model for enhancing the effectiveness and accessibility of community-based youth STEM and STEAM initiatives across Canada. As after-school programs strive to enhance their offerings and target populations, the insights from Duodu et al.'s case study (2017) serve as a valuable blueprint, ultimately ensuring that all youth have equal opportunity to develop their skills and knowledge in engaging, safe, inclusive, and accessible environments.

Our research identified several challenges related to the implementation of the Nexus program. First, because this offering of the Nexus program was linked to a research project for a program report, we were limited in the number of schools we could contact for advertising and recruitment, as well as the amount of time we could dedicate to these efforts. In contrast, Mathstronauts can typically cast a wider net in their

recruitment and advertising, which allows them to effectively spread the word and reach a broader range of student groups in the future. Second, as a virtual STEM ASP, several issues can arise: first, the Nexus program participants noted that it is sometimes difficult to stay focused and actively engaged, particularly during sessions that are more content-dense than others. We advised that Mathstronauts should implement several short breaks during sessions, which has the potential to improve participant performance (i.e., concentration, engagement, and retention of content). We also believe that incorporating more activities with discussions, quizzes, and challenges during the program sessions can maintain student interest, and using gamified elements (e.g., badges, points, leaderboards) can help to create excitement and keeps students motivated to participate.

Limitations

We identified several limitations in our research. Firstly, we did not observe how students interacted during the program sessions (peer-peer and peer-instructor interactions) and relied solely on what the participants shared with us. Participant observation would have allowed us to capture the nuances of these interactions and would have given us a deeper understanding of how the instructor supported the participants and how the participants received and processed the support. Considering that analyzing the impact of support systems was not the goal of the initial research project, this would be an important study in the future. Secondly, there was little we could do for ensuring participant accountability in completing the surveys and participating in the focus groups; participants were admitted to the program free of cost, which is worth $200 per person and were told that they could remove themselves from the research at any time without

losing their spot in the program, so the survey response rate and focus group participation was expected to fluctuate. In the future, we would consider different ways to boost accountability and response rate including cash incentives (gift cards) or other non-cash incentives. Thirdly, most participants in the research cohort entered grade 12 in September 2023, and we could not track their PSE intentions or outcomes like those who graduated in June 2023. As such, to assess the long-term impacts of the program, it would be useful to track the impacts of the program through interviews with several participants one year after the program finishes, around the time that they apply to university, and then conduct a follow-up after their first semester of PSE. It may also be impactful to conduct ongoing monitoring of these long-term impacts with several agreeing participants. These interviews would help us understand their motivations for attending PSE and the impact of the program on their educational trajectories and every-day lives.

Avenues for future research

Throughout our research, we identified several avenues for future research that would contribute to current literature in PSE pathways and outcomes. Firstly, it would be beneficial to conduct a deeper exploration into the impacts (short- and long-term) of comparison on students' educational pathways, achievement, and/or PSE intentions. As briefly discussed in our results, several participants found themselves comparing their passions, academic achievements, and educational pathways to that of their older siblings who have found success in area of STEM. In some cases, participants felt that this comparison helped them in the long run, but others had difficulty navigating the comparisons they made, which were sparked in the classroom during interactions with

their teachers who also taught their siblings, and in their home environment in conversations with their parents and siblings. Research on the long-term impacts of social comparison on academic performance and academic self-concepts has been conducted in the field of psychology (Jansen et al., 2022; Wehrens et al., 2010), but little could be found within sociological research. Therefore, the question of the long-term effects of comparison on their educational outcomes remains up for analysis. This research could be conducted with participants of an ASP like Mathstronauts' Nexus Program, or with students in their secondary to post-secondary transition. Secondly, research that tracks the impacts of other soft and hard skill development programs that support students in high school and into their first years of PSE would be valuable to both the field of sociology and to after-school/preparatory programs looking to improve their offerings. It will also reinforce the importance of providing relevant support to students as they prepare to enter PSE. Thirdly, we were unable to delve deeply into an analysis of the instructor-participant relationship in this research. As such, we suggest that future research conducted with ASPs should include an exploration of the complexities and nuances of this relationship and their interactions within the program environment.

Lastly, as discussed by Christensen et al. (2023), research on ASPs relating specifically to STEM programs targeted towards underrepresented youth in Canadian education landscape is limited. We believe this has several research implications which should be addressed in the future. Notably, it (a) creates a gap in research that highlights the experiences of diverse student groups across Canada, and a gap in evidence-based practices for designing and implementing effective After-School STEM programs; and (b)

the lack of research on After-school STEM programs targeted towards underrepresented youth can result in lower awareness among the public and stakeholders about the importance of such programs, thus impacting the level of interest in and mobilization of resources to support these programs. We believe to address these implications, researchers and policy developers must invest in and conduct research that specifically examines the needs of students who are interested in STEM but are underrepresented in related educational programs, and the role(s) ASPs can play in supporting their goals.

Conclusion

This case study shows how after-school programming plays a crucial role in supporting underrepresented and at-risk youth not only pursue their PSE goals but also provide immense support in developing sense of belonging and community outside of the school setting. The Nexus program is a small-scale representation of what ASPs can provide to youth. Although there are several before- and ASPs in the Hamilton area that provide generalized care and learning opportunities for youth, there are very few options available that focus on supporting the PSE aspirations of underrepresented and at-risk youth; one example is the Student Navigation Program by the non-profit organization Empowerment Squared[18]. As such, there is a need to expand program offerings to target students who are not just pursuing STEM education, but those who require additional support to graduate high school and pursue any type of PSE. Further, ASPs can increase their education and training offerings by identifying the skills needed for entering the job market (problem

[18] Visit their website for additional information: https://empowermentsquared.org/student-navigation-program/

solving, creativity, analytical skills, etc.), ultimately creating a program design that better prepares high school graduates for educational and work opportunities. The challenge moving forward is to identify student groups who have yet to be targeted for after-school programming that supports PSE goals and achievement to ensure all Canadian youth have a fair chance of pursuing their goals.

Interest in STEM fields can significantly boost ASP program participants' readiness for PSE by bridging the gap between secondary-school learning and PSE expectations. ASPs like the Nexus program can support the development of foundational STEM skills and soft skills (e.g. critical thinking, analytical skills, time-management, problem-solving, etc.) that are highly valued in PSE environments. Engagement within these ASPs can further support this readiness by fostering collaboration and offering opportunities for hands-on learning, all of which prepare students to excel in PSE settings.

While there is always room for improvement to provide the most impactful ASPs for at-risk and underrepresented youth and to support the sustainability of programs like Nexus, the findings from this research have not only aided in the improvement of delivering the Nexus program, but have highlighted the role ASPs can play as positive and engaging importance of support systems for students who are typically underrepresented in STEM within PSE. With a strong focus on building relevant skills, on creating peer, instructor, and community connection, on student ownership, and including parents in the program delivery, ASPs – whether focused on STEM skills, or offer different skill development programming – can offer an impactful educational and social

support space for youth. This article can provide strong insights for other program stakeholders interested in implementing similar programming for Canadian youth.

Declaration of Interest Statement

The authors report no conflict of interest.

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References

Abada, T., Hou, F., & Ram, B. (2009). Ethnic Differences in Educational Attainment Among the Children of Canadian Immigrants. *Canadian Journal of Sociology*, *34*(1), 1–29.

Adamuti-Trache, M., & Andres, L. (2008). Embarking on and Persisting in Scientific Fields of Study: Cultural capital, gender, and curriculum along the science pipeline. *International Journal of Science Education*, *30*(12), 1557–1584. Doi: 10.1080/09500690701324208

Ahmadi, S., Hassani, M., & Ahmadi, F. (2020). Student- and school-level factors related to school belongingness among high school students. *International Journal of Adolescence and Youth*, *25*(1), 741–752. Doi: 10.1080/02673843.2020.1730200

Anderman, L. H., & Freeman, T. (2004). Students' Sense of Belonging in School. In P. R. Pintrich & M. L. Maehr (Eds.), *Motivating students, improving schools: The legacy of Carol Midgley* (pp. 27–63). Elsevier.

Anderson, E., Easson, K., Kharas, K., Kum, J., & Cimon-Paquet, C. (2022). EDI at Every Level: Inequities and Under-Representation in STEM. *Canadian Science Policy Centre (CSPC)*.

Areepattamannil, S., & Lee, D. H. L. (2014). Linking Immigrant Parents' Educational Expectations and Aspirations to Their Children's School Performance. *The Journal of Genetic Psychology*, *175*(1), 51–57.

Baran, E., Canbazoglu Bilici, S., Mesutoglu, C., & Ocak, C. (2019). The impact of an

out-of-school STEM education program on students' attitudes toward STEM and STEM careers. *School Science and Mathematics*, *119*(4), 223–235. Doi: 10.1111/ssm.12330

Bartlett, N. A., & Freeze, T. B. (2018). Community Schools: New Perspectives on the Wraparound Approach. *Exceptionality Education International*, *28*(2). Doi: 10.5206/eei.v28i2.7765

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. Doi: 10.1037/0033-2909.117.3.497

Bertrand, M. G., & Namukasa, I. K. (2020). STEAM education: Student learning and transferable skills. *Journal of Research in Innovative Teaching & Learning*, *13*(1), 43–56. Doi: 10.1108/JRIT-01-2020-0003

Bulanda, J. J., & McCrea, K. T. (2013). The Promise of an Accumulation of Care: Disadvantaged African-American Youths' Perspectives About What Makes an After School Program Meaningful. *Child and Adolescent Social Work Journal*, *30*(2), 95–118. Doi: 10.1007/s10560-012-0281-1

Chan, H.-Y., Choi, H., Hailu, M. F., Whitford, M., & Duplechain DeRouen, S. (2020). Participation in structured STEM-focused out-of-school time programs in secondary school: Linkage to postsecondary STEM aspiration and major. *Journal of Research in Science Teaching*, *57*(8), 1250–1280. Doi: 10.1002/tea.21629

Cheung, S. (2007). *Educational decisions of Canadian youth: A synthesis report on access to postsecondary education*. Higher Education Quality Council of Ontario.

Childs, S., Finnie, R., & Mueller, R. E. (2010). Family Environment, Family Habits, and Children's Cultural Experiences: Is There a Link to Participation in Post-Secondary Education? In R. Finnie, M. Frenette, R. E. Mueller, & A. Sweetman (Eds.), *Pursuing Higher Education in Canada: Economic, Social, and Policy Dimensions* (pp. 243–267). McGill-Queen's Press.

Christensen, K. M., Kremer, K. P., Poon, C. Y. S., & Rhodes, J. E. (2023). A meta-analysis of the effects of after-school programmes among youth with marginalized identities. *Journal of Community & Applied Social Psychology*, *33*(4), 882–913. Doi: 10.1002/casp.2681

Christie, H., Barron, P., & D'Annunzio-Green, N. (2013). Direct entrants in transition: Becoming independent learners. *Studies in Higher Education*, *38*(4), 623–637. Doi: 10.1080/03075079.2011.588326

Cochran, G. L., Boveda, M., & Prescod-Weinstein, C. (2020). Chapter 20: Intersectionality in STEM Education Research. In C. C. Johnson, M. J. Mohr-Schroeder, T. J. Moore, & L. D. English (Eds.), *Handbook of Research on STEM Education* (pp. 157–266). Routledge.

Collins, P. H. (2019). The Difference That Power Makes: Intersectionality and Participatory Democracy. In O. Hankivsky & J. Jordan-Zachery (Eds.), *The Palgrave Handbook of Intersectionality in Public Policy* (pp. 167–192). Palgrave Macmillan, Cham.

Collins, P. H., Da Silva, E. C. G., Ergun, E., Furseth, I., Bond, K. D., & Martínez-

Palacios, J. (2021). Intersectionality as Critical Social Theory. *Contemporary Political Theory*, *20*(3), 690–725. Doi: 10.1057/s41296-021-00490-0

Crenshaw, K. (1991). Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color. *Stanford Law Review*, *43*(6), 1241–1299. Doi: 10.2307/1229039

Davies, S. C., & Peltz, L. J. (2012). At-risk students in after-school programs: Outcomes and recommendations. *Principal Leadership*, *13*(2), 12–17.

Davis, D. J., Brunn-Bevel, R. J., & Olive, J. L. (Eds.). (2015). Introduction. In *Intersectionality in Educational Research* (1st ed., pp. 1–15). Routledge. Republished in 2023. Doi: 10.4324/9781003445401

Definition of an At Risk Youth. (2021, July 19). *At Risk Youth Programs*. https://atriskyouthprograms.com/definition-of-an-at-risk-youth

Duodu, E., Noble, J., Yusuf, Y., Garay, C., & Bean, C. (2017). Understanding the delivery of a Canadian-based after-school STEM program: A case study. *International Journal of STEM Education*, *4*(1). Doi: 10.1186/s40594-017-0083-2

Escudé, M., Rivero, E., & Montano, J. (2020). Designing for Belonging and Becoming in an Afterschool Tinkering Program. *Afterschool Matters*, *31*.

Faircloth, B. S., & Hamm, J. V. (2005). Sense of Belonging Among High School Students Representing 4 Ethnic Groups. *Journal of Youth and Adolescence*, *34*(4), 293–309. Doi: 10.1007/s10964-005-5752-7

Finnie, R., & Childs, S. (2018). Who Goes into STEM Disciplines? Evidence from the

Youth in Transition Survey. *Canadian Public Policy*, *44*(S1), S43–S55. Doi: 10.3138/cpp.2017-077

Friesen, L., & Purc-Stephenson, R. J. (2016). Should I Stay or Should I Go? Perceived Barriers to Pursuing a University Education for Persons in Rural Areas. *The Canadian Journal of Higher Education*, *46*(1), 138–155.

Gandhi, J., Watts, T. W., Masucci, M. D., & Raver, C. C. (2020). The Effects of Two Mindset Interventions on Low-Income Students' Academic and Psychological Outcomes. *Journal of Research on Educational Effectiveness*, *13*(2), 351–379. Doi: 10.1080/19345747.2019.1711272

Giving every child the best start in life. (2024, May 17). Prime Minister of Canada. https://www.pm.gc.ca/en/news/news-releases/2024/05/17/giving-every-child-best-start-life

Government of Canada. (2021a, August 13). *The Government of Canada and STEM – Choose science*. Government of Canada.

Government of Canada, S. C. (2021b, September 17). *Visible minority of person*. https://www23.statcan.gc.ca/imdb/p3Var.pl?Function=DEC&Id=45152

Government of Canada. (2023a). *Postsecondary enrolments, by International Standard Classification of Education, institution type, Classification of Instructional Programs, STEM and BHASE groupings, status of student in Canada, age group and gender*. Government of Canada, Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710016301

Government of Canada. (2023b). *Postsecondary graduates, by International Standard*

Classification of Education, institution type, Classification of Instructional Programs, STEM and BHASE groupings, status of student in Canada, age group and gender. Government of Canada, Statistics Canada. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710016401

Graham, M. C., Jacobson, K., Husman, J., Prince, M., Finelli, C., Andrews, M. E., & Borrego, M. (2023). The relations between students' belongingness, self-efficacy, and response to active learning in science, math, and engineering classes. *International Journal of Science Education*, *45*(15), 1241–1261. Doi: 10.1080/09500693.2023.2196643

Hackett, H., & Baran, D. (1995). Canadian Action on Early School Leaving: A Description of the National Stay-in-School Initiative. *ERIC Digest*, 2.

Halpern, R. (1999). After-school programs for low-income children: Promise and challenges. *Future Child*, *9*(2), 81–95.

Halpern, R. (2002). A Different Kind of Child Development Institution: The History of After-School Programs for Low-Income Children. *Teachers College Record: The Voice of Scholarship in Education*, *104*(2), 178–211. https://doi.org/10.1111/1467-9620.00160

Hamilton, L., & Corbett-Whittier, C. (2013). *Using Case Study in Education Research*. SAGE Publications Ltd. Doi: 10.4135/9781473913851

Hamilton, Ontario, Canada: History, Facts, Map, & Points of Interest. (2024, February 5). Britannica. https://www.britannica.com/place/Hamilton-Ontario

Hansen, M. J., Palakal, M. J., & White, L. (2024). The Importance of STEM Sense of

Belonging and Academic Hope in Enhancing Persistence for Low-Income, Underrepresented STEM Students. *Journal for STEM Education Research*, *7*(2), 155–180. Doi: doi.org/10.1007/s41979-023-00096-8

Hernandez, P. R., Schultz, P. W., Estrada, M., Woodcock, A., & Chance, R. C. (2013). Sustaining optimal motivation: A longitudinal analysis of interventions to broaden participation of underrepresented students in STEM. *Journal of Educational Psychology*, *105*(1), 89–107. Doi: 10.1037/a0029691

Hoffman, A. J., McGuire, L., Rutland, A., Hartstone-Rose, A., Irvin, M. J., Winterbottom, M., Balkwill, F., Fields, G. E., & Mulvey, K. L. (2021). The Relations and Role of Social Competencies and Belonging with Math and Science Interest and Efficacy for Adolescents in Informal STEM Programs. *Journal of Youth and Adolescence*, *50*(2), 314–323. Doi: 10.1007/s10964-020-01302-1

Jackson, D. L. (2013). Making the Connection: The Impact of Support Systems on Female Transfer Students in Science, Technology, Engineering, and Mathematics (STEM). *The Community College Enterprise*, *19*(1), 19–33.

Jansen, M., Boda, Z., & Lorenz, G. (2022). Social comparison effects on academic self-concepts—Which peers matter most? *Developmental Psychology*, *58*(8), 1541–1556. Doi: 10.1037/dev0001368

Kennedy, B. L., & Thornberg, R. (2018). Chapter 4: Deduction, Induction, and Abduction. In U. Flick (Ed.), *The SAGE Handbook of Qualitative Data Collection* (pp. 49–64). SAGE Publications Ltd. https://sk.sagepub.com/reference/the-sage-handbook-of-qualitative-data-collection

Kremer, K. P., Maynard, B. R., Polanin, J. R., Vaughn, M. G., & Sarteschi, C. M. (2015). Effects of After-School Programs with At-Risk Youth on Attendance and Externalizing Behaviors: A Systematic Review and Meta-Analysis. *Journal of Youth and Adolescence*, *44*(3), 616–636. Doi: 10.1007/s10964-014-0226-4

Kricorian, K., Seu, M., Lopez, D., Ureta, E., & Equils, O. (2020). Factors influencing participation of underrepresented students in STEM fields: Matched mentors and mindsets. *International Journal of STEM Education*, *7*(1), 16. Doi: 10.1186/s40594-020-00219-2

Lester, A. M., Chow, J. C., & Melton, T. N. (2020). Quality is Critical for Meaningful Synthesis of Afterschool Program Effects: A Systematic Review and Meta-analysis. *Journal of Youth and Adolescence*, *49*(2), 369–382. Doi: 10.1007/s10964-019-01188-8

Li, M., Nicholson, E., Ong, F., Rai, S., & Smith, S. (2020). *Mathstronauts High School Program Needs Assessment* [Report]. Prepared by the McMaster Research Shop for Mathstronauts. https://macsphere.mcmaster.ca/handle/11375/25844

Lindsay, S., Hartman, L. R., & Fellin, M. (2016). A systematic review of mentorship programs to facilitate transition to post-secondary education and employment for youth and young adults with disabilities. *Disability and Rehabilitation*, *38*(14), 1329–1349.

Mahoney, J. L., Parente, M. E., & Zigler, E. F. (2009). Afterschool Programs in America: Origins, Growth, Popularity, and Politics. *Journal of Youth Development*, *4*(3), Article 3. Doi: 10.5195/jyd.2009.250

McGee, E. O. (2020). Interrogating Structural Racism in STEM Higher Education. *Educational Researcher*, *49*(9), 633–644. Doi: 10.3102/0013189X20972718

Neally, K. (2023). Underrepresentation of Minoritized Groups in STEM Education: The Development of a Survey. *Journal of Interdisciplinary Studies in Education*, *12*(1), 146–170.

Ng, B. (2023). Conceptualizing Lifelong Learning for K-12 Education. *Journal of Research Initiatives*, *7*(2).

O'Neill, T. B. (2010). Fostering Spaces of Student Ownership in Middle School Science. *Equity & Excellence in Education*, *43*(1), 6–20. Doi: 10.1080/10665680903484909

Paramalingam, A., Majid, U., Okelana-Awolusi, O., & Cranmer-Byng, S. (2018). *The Role of After-School Programs in Promoting Academic and Life Success of Immigrant, Refugee and Racialized Children and Youth*. McMaster University Research Shop, prepared for Empowerment Squared.

Philp, K. D., & Gill, M. G. (2020). Reframing After-School Programs as Developing Youth Interest, Identity, and Social Capital. *Policy Insights from the Behavioral and Brain Sciences*. Doi: 10.1177/2372732219892647

Prema, D., & Dhand, R. (2019). Inclusion and accessibility in STEM education: Navigating the duty to accommodate and disability rights. *Canadian Journal of Disability Studies*, *8*(3), Article 3. Doi: 10.15353/cjds.v8i3.510

Proudfoot, K. (2023). Inductive/Deductive Hybrid Thematic Analysis in Mixed Methods

Research. *Journal of Mixed Methods Research*, *17*(3), 308–326. Doi: 10.1177/15586898221126816

Priya, A. (2021). Case Study Methodology of Qualitative Research: Key Attributes and Navigating the Conundrums in Its Application. *Sociological Bulletin*, *70*(1), 94–110. Doi: 10.1177/0038022920970318

Pryce, J. M., Kelly, M. S., & Lawinger, M. (2019). Conversation Club: A Group Mentoring Model for Immigrant Youth. *Youth & Society*, *51*(7), 879–899. Doi: 10.1177/0044118X18780526

Riggs, N. R., & Greenberg, M. T. (2004). After-School Youth Development Programs: A Developmental-Ecological Model of Current Research. *Clinical Child and Family Psychology Review*, *7*(3), 177–190. Doi: 10.1023/B:CCFP.0000045126.83678.75

Robson, K., Anisef, P., Brown, R. S., & George, R. (2018). Underrepresented Students and the Transition to Postsecondary Education: Comparing Two Toronto Cohorts. *Canadian Journal of Higher Education*, *48*(1), 39–59. Doi: 10.47678/cjhe.v48i1.187972

Sahin, A., Ayar, M. C., & Adiguzel, T. (2014). STEM Related After-School Program Activities and Associated Outcomes on Student Learning. *Educational Sciences: Theory and Practice*, *14*(1), 309–322.

Saj, D., Farenhorst, A., & Peter, T. (2018). Perceptions of Underrepresentation Among Students in STEM Fields: An Empirical Analysis. *Proceedings of Manitoba's Undergraduate Science and Engineering Research*, *4*(1), 17–23. Doi: 10.5203/pmuser.201841636

Salerno, J. (2023, January 26). What Is an "At-Risk" Youth? Part 1. *Possibilities for Change*. https://possibilitiesforchange.org/what-is-an-at-risk-youth-part-1/

Schneider, C. (1996). *Creating a Community Mobilization Guide for Employment and Immigration Canada's "Stay In School Initiative."* University of Manitoba.

Statistics Canada. (2023a). *Before and After School Care in Canada*. Statistics Canada. https://www.statcan.gc.ca/o1/en/plus/2832-and-after-school-care-canada

Statistics Canada. (2023b). *Census Profile. 2021 Census of Population* [Database]. Statistics Canada. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E

Sutter, A., & Esses, V. M. (2021). *Discrimination Experienced by Immigrants, Visible Minorities, and Indigenous Peoples in Hamilton*. Hamilton Immigration Partnership Council and Network for Economic and Social Trends (NEST), Western University.

Sweet, R., Pullman, A., Adamuti-Trache, M., & Robson, K. (2019). Ethnolinguistic patterns of degree completion in BC universities: How important are high-school academic achievement and institution of entry? *Canadian Journal of Higher Education*, *49*(3), 69–88.

Tellhed, U., Bäckström, M., & Björklund, F. (2017). Will I Fit in and Do Well? The Importance of Social Belongingness and Self-Efficacy for Explaining Gender Differences in Interest in STEM and HEED Majors. *Sex Roles*, *77*(1), 86–96. Doi: 10.1007/s11199-016-0694-y

Vila-Henninger, L., Dupuy, C., Van Ingelgom, V., Caprioli, M., Teuber, F., Pennetreau, D.,

Bussi, M., & Le Gall, C. (2022). Abductive Coding: Theory Building and Qualitative (Re)Analysis. *Sociological Methods & Research*, 00491241211067508. Doi: 10.1177/00491241211067508

Wehrens, M. J. P. W., Kuyper, H., Dijkstra, P., Buunk, A. P., & Van Der Werf, M. P. C. (2010). The long-term effect of social comparison on academic performance. *European Journal of Social Psychology*, *40*(7), 1158–1171. Doi: 10.1002/ejsp.706

Wright, R., John, L., Duku, E., Burgos, G., Krygsman, A., & Esposto, C. (2010). After-School Programs as a Prosocial Setting for Bonding Between Peers. *Child & Youth Services*, *31*(3–4), 74–91. Doi: 10.1080/0145935X.2009.524461

Yin, R. (2014). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Yu, R., Haddock, A., & Womack, T. (2022). Integrating Supports for Students with Wraparound. *Contemporary School Psychology*, *26*(2), 155–163. Doi: 10.1007/s40688-020-00284-y

CONCLUSION

Using a mixed-methods approach, each of the three empirical chapters in this dissertation examines factors associated with Canadian students' PSE intentions, with specific attention in the second and third empirical chapters on the relationship(s) between support systems, school belonging, and PSE intentions. This chapter begins by summarizing the main findings from each of the three chapters. This is followed by a discussion of the main themes identified across all chapters and concludes by examining the limitations of the work found in this dissertation as well as avenues for future research.

Summary of Findings

Chapter 2 provided a comprehensive systematic review of research on PSE transitions in Canada, which set the stage for identifying the challenges and opportunities in supporting students through these transitions. The chapter explores the intersectional factors, including gender, race, and socioeconomic status, that influence students' decisions and transitions to PSE, particularly for those from underrepresented backgrounds. It underscores the importance of community-specific early intervention programs, such as Pathways to Education, which offer critical academic, financial, and social support to help students succeed and reach their post-secondary goals. The findings suggest that addressing these factors through comprehensive support systems can improve PSE transitions and help ensure greater access and success for marginalized youth.

Chapter 3 investigated the impacts of support systems on school belonging and PSE intentions for high school students in the TDSB, which highlighted the critical role of school and parental support in shaping students' intentions to pursue PSE, emphasizing

the importance of school belonging, parental involvement, and student acceptance in this process. While racial and gender differences do influence these experiences, they only partially mediate the relationship between support and post-secondary intentions, with racial minorities being particularly impacted by a sense of belonging. Additionally, academic streaming interacts with these support systems, with students in lower streams requiring more direct support from teachers and parents, while those in academic streams rely on peer acceptance and less direct parental involvement.

Chapter 4 used a case study method to investigate the role of after school programming in developing belongingness, PSE readiness, and positive attitudes toward PSE. The chapter demonstrates the significant role of ASPs like the Nexus program in supporting at-risk and underrepresented youth, helping them pursue their PSE goals while fostering a sense of belonging and community. While many ASPs exist, there is a gap in programs specifically targeting the PSE aspirations of these youth, highlighting the need for expanded offerings to support diverse educational and career pathways. ASPs can improve their impact by cultivating skills needed for both education and the job market, ensuring all Canadian youth have the opportunity to succeed in PSE and beyond.

Cohesive Themes Across Chapters

The above findings highlight several cohesive themes across all chapters. This dissertation emphasizes the importance of a holistic support approach for students, which includes academic, social, and emotional support that enhances students' overall well-being and transition readiness. With a focus on creating environments where students feel supported and valued, each chapter contributes to the understanding of how fostering a

sense of belonging in educational settings is crucial for facilitating successful transitions. The theme of belongingness plays a critical role in students' PSE intentions/aspirations, as a sense of community within schools and extracurricular programs positively influences students' readiness for higher education, particularly for marginalized groups. Findings throughout this dissertation consistently highlight the intersectional factors of race, gender, and socioeconomic status, demonstrating how these elements shape students' educational intentions and decisions, emphasizing the need for equitable opportunities and targeted support for diverse student populations.

These cohesive themes offer insights for policy and practice implications. The findings can be used to develop comprehensive support programs that focus on academic, social, and emotional support to ensure students feel more prepared and supported throughout their transitions. The case study can help foster collaboration between educational policymakers and community organizations that can enhance the availability and effectiveness of support services beyond formal educational settings. By enhancing school belonging and well-being initiatives including (but not limited to) mentorship programs, peer support groups, and inclusive school activities, students can feel more connected to their educational, extracurricular, and wider communities, which in turn can improve school engagement, retention and success rates.

Next, policymakers can use findings from all three chapters to inform policy decisions related to PSE transitions. This may include funding allocation for support programs, guidelines for effective transition strategies, and initiatives to reduce barriers that students face during these critical educational transitions. Finally, findings from this

dissertation can guide professional development programs for educators and administrators. Training sessions can focus on understanding the needs of transitioning students, implementing effective support strategies, and creating inclusive and supportive learning environments.

Limitations

While each chapter identifies limitations specific to their respective data collection and analysis processes, there are several more general limitations to this research. First, we were unable to look at more specific communities of students (for example, rural students versus urban students), and we were limited in how many different types of supports we could investigate, which includes their unique components, nuances and dynamics. Second, in a similar sense, we were limited in the type of data we could use – time and funding constraints did not allow for primary data collection, both qualitative and quantitative. While only secondary data was used, I aimed to provide a mixed-methods investigation into the topic. Lastly, this dissertation did not investigate the impact and role(s) of student engagement in sense of belonging and PSE intentions; while student engagement is a crucial factor to consider and is widely regarded as having a significant impact on student achievement and outcomes (Klem & Connell, 2004; Tao et al., 2022; Wong et al., 2024), the secondary data used in this dissertation did not allow for this inquiry. In consideration of these limitations, future research could address these gaps and explore avenues for gathering up-to-date and useful data, both quantitative and qualitative.

References

Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, *74*(7), 262–274.

Tao, Y., Meng, Y., Gao, Z., & Yang, X. (2022). Perceived teacher support, student engagement, and academic achievement: A meta-analysis. *Educational Psychology*, *42*(4), 401–420. https://doi.org/10.1080/01443410.2022.2033168

Wong, Z. Y., Liem, G. A. D., Chan, M., & Datu, J. A. D. (2024). Student engagement and its association with academic achievement and subjective well-being: A systematic review and meta-analysis. *Journal of Educational Psychology*, *116*(1), 48–75. https://doi.org/10.1037/edu0000833