EXPLORING PATHWAYS TO PUBLIC HEALTH CAREERS:

THE DALLA LANA SCHOOL OF PUBLIC HEALTH PROGRAM

Centre of Excellence for Black Student Achievement

Toronto District School Board

Dalla Lana School of Public Health

TITLE: Exploring Pathways to Public Health Careers: The Dalla Lana School of Public Health Program

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Executive Summary

The Centre of Excellence for Black Student Achievement (“Centre of Excellence” or “the Centre”) partnered with the Dalla Lana School of Public Health to engage Black students at the Toronto District School Board (TDSB) in their Pathways to Public Health program. The purpose of the program is to build Black students' awareness of the careers, pathways and opportunities within the public health system while offering opportunities to connect with Black health professionals.

The report outlines findings from an evaluation of the program held in May 2023. Students were encouraged to complete a survey at the end of the program. The response rate of the online survey totalled eighteen (*n*=18) students.

Findings from the online survey reveal that Black students' reasons for participating in the program included:

- Interest in the Public Health sector;
- Opportunities to connect with and be mentored by Black professionals; and
- Enhanced knowledge about Public Health careers.

Other key themes discussed in the report include Black students' engagement with science, technology, engineering and math (STEM), feeling supported by their school in their pursuit of their interest in STEM, access to mentors and role models in their school-community, overall experience in the program, facilitators support and mentorship and aspirations for a future career in public health.

In addition, students provided recommendations to improve and enhance the viability of the program. The suggestions include interactive learning methods, expanding the program to schools and increased knowledge about health science and relationships with mentors for cultural capital.

Introduction

Post-secondary education is vital in the 21st century labour market. Training in the trades, college, and university are viewed as minimal requirements for entrance to a meaningful career (Karaca-Atik et al., 2023; International Labour Organization, 2021; Rainie & Anderson, 2017). Academic preparation and graduation pathways including job readiness and/or post-secondary access are critical to Black[1] students' high school experience (Parekh et al., 2020; Taylor, 2021). So too are interrelated factors such as providing mentorship opportunities, access to role models, resources and support both in school, and the community. The vast majority of Black students aspire to some kind of post-secondary education and/or career, yet far too many of them enter without the basic content knowledge, skills, or habits of mind they need to succeed. At the broader level, graduation pathways for Black students are tied to differences in high school experiences.

Research has shown that factors such as race, gender, disability, school readiness, academic programming, educational guidance, proximity to post-secondary institutions, support systems, and discriminatory practices help to shape and determine schooling opportunities (Glogowski & Rakoff, 2019; James & Parekh, 2021; Parekh et al., 2020; Ontario Human Rights Commission, 2018; Wong, 2022). A Statistics Canada report (2020) examining a cohort of Black Canadian youth, based on the 2006 and 2016 censuses, found that Black students complete high school at a similar rate to other racial groups. However, the cohort of Black teens from 2006 were less likely than their counterparts to have a post-secondary certificate, diploma or degree 10 years later (Turcotte, 2022). Therefore, interventions to improve their readiness offer a variety of services, from academic preparation, socio-emotional support, to the development of organizational skills, anticipation and persistence.

Retention of Black Canadian students in STEM courses or pathways has been a challenge that often deter them from continuing their education. Having an adult or mentor to encourage students has been found to establish a foundation for youth success by building self-confidence, self esteem, positive identity, and self-reliance (Munroe et al., 2022; Ewers et al., 2022; Shooter et al., 2015; McGee, 2018; Wilson et al, 2012). Furthermore, research has pointed to data regarding the numerous Black students who enter STEM programs without knowing how to navigate the system effectively and are adversely affected (National Academies of Sciences, Engineering,

[1] The term Black refers to individuals, peoples or communities of Black /African descent living in Canada. This may include, but are not limited to individuals or peoples from the Black diaspora with varying geographical, historical, cultural, national, ethnic, religious, and ancestral origins and influences (e.g. African, African-Canadian, Afro-Caribbean, Afro-Latin, Afro-Indigenous, Afro-Europeans).

and Medicine, 2022). As a result, there is a call for active support for Black students through non-profit organizations, community groups, and informal conversations with them (Adams, 2021; Habig, 2020; McGee, 2020; Kulandaivelu, n.d).

The importance of school-family-community engagement to support Black students increases access to learning opportunities and supports their success. Community partnerships that provide a strong network of support, resources, and increased educational opportunities contribute to positive academic outcomes and help eliminate barriers (Griffin et al., 2021). Community engagement to support Black Canadian students often represents the needs of the families and community (Butler, 2021; Munroe et al., 2022b; Sylvestre, 2018). Such practices can create social capital, build trust and relationships and leverage partnerships to address educational and family needs (DeMatthews, 2018). Thus, school initiatives that involve the community can help Black students map out their graduation pathways and see how education affects their lives.

While the concern for and focus on improving the Post-Secondary Education (PSE) participation of Black students is not a recent phenomenon in the Canadian landscape, it is important that we identify the importance of the school-community partnership as support that can help Black pupils to improve their PSE and career pathways. These lessons are simple: only the commitment to working collaboratively with families and communities can catalyze the engagements of educators, and ensure success of Black students. The next steps in K-12 spaces should involve the development of a more permanent presence of community partnerships to further our knowledge of how strengths-based community engagement and participatory approaches can support Black students in pursuing STEM academic and public health career pathways.

About The Centre of Excellence for Black Students

The Centre of Excellence[2] was established in 2021 and is first of its kind in public education in North America. It was built on Black community voices through past and ongoing efforts for direct, multi-faceted strategies and engagement to support meaningful and sustained change at TDSB. The Centre of Excellence is one of TDSB's responses to dismantle anti-Black racism within the board and to improve both experiences and outcomes for Black students. It has nine (9) key mandates which

[2] Centre of Excellence for Black Student Achievement

include providing support to Black students, identifying barriers to success and accessing appropriate resources such as scholarships, networking and mentoring[3].

The work at the Centre of Excellence includes educational and community partnerships to provide opportunities for Black students to build their skills and knowledge of specific careers and career fields, university, and apprenticeship programs, and how to enter the workforce. These opportunities to explore various pathways provide Black students with valuable skills and experience that will be required in the future job market.

Centre of Excellence for Black Student Achievement and Dalla Lana School of Public Health Partnership

The Centre of Excellence partnered with the Dalla Lana School of Public Health (DLSPH) to develop the Pathways to Public Health program. The program's objective was to raise the awareness of career pathways and opportunities within the Public Health system for Black TDSB students, while also providing them with opportunities to connect with Black health professionals (e.g. at the Dalla Lana School of Public Health Outreach and Access Program, University of Toronto).

Specifically, the objectives of the program were:

1. Promotion of life skills (communication, self-management, critical thinking, leadership, teamwork) for students through mentorship;
2. Core competencies of the public health system;
3. Raise awareness of disciplines and careers within public health through engagement with DLSPH faculty;
4. Problem solving skills through group-based learning activities;
5. The utilization of facilitators as a resource.

The program was delivered for a duration of ten (10) weeks. All the sessions were conducted from March 7th to May 16th, 2023. Participating students met once a week on Tuesdays from 5:00 to 7:00 pm at the Centre of Excellence located in Scarborough, Ontario.

[3] Toronto District School Board (2023). About the Centre of Excellence for Black Student Achievement: https://www.tdsb.on.ca/CEBSA/About-Us

The structure of the program varied but often included one hour sessions on a specific topic, opportunities for mentorship, group discussions, and group activities. This structure (see Table 1) was designed to enhance knowledge about public health concepts and develop life skills.

Table 1

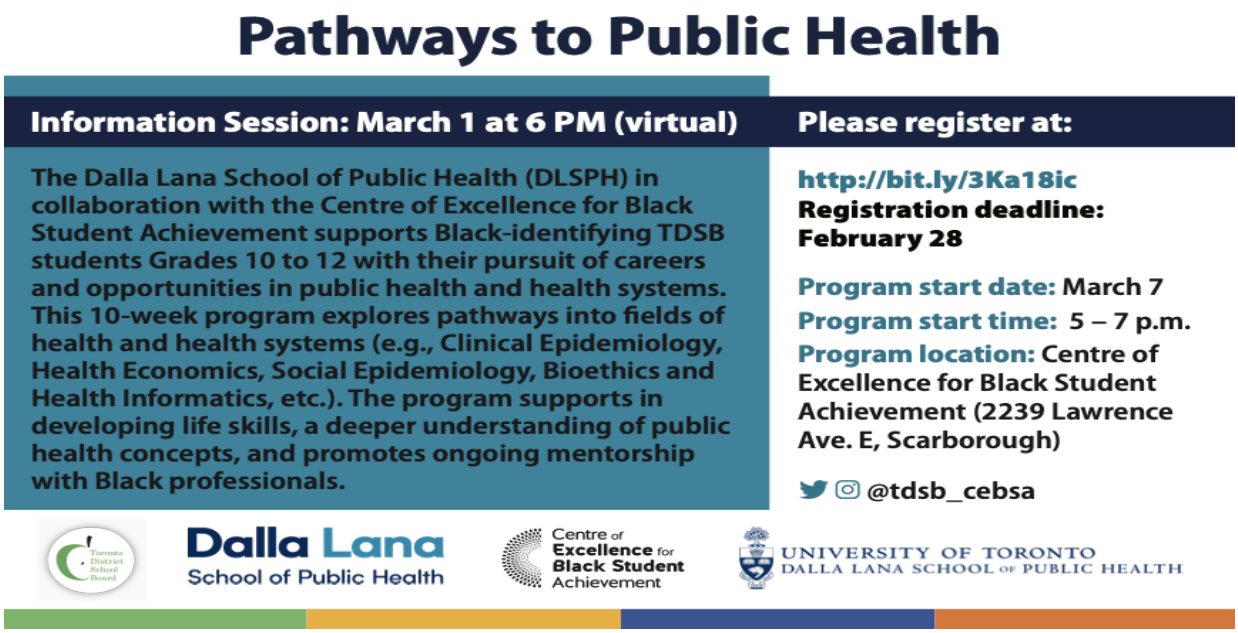
Pathways to Public Health Program Outline

Session	Topic	Activity	Videos & Links	Discussion
1	Introduction to DLSPH Outreach and Access Program	-Icebreakers -Overview of Program		-Getting to know students -Skills, passions, and aspirations
2	Identity	Scavenger Hunt	Social Identity vs. Identity Theory	-What contributes to the way you view yourself?
3	Faculty Presentation: Intro to Public Health	Presentation and Discussion		-What is Public Health? -How is it different from clinical health? -What does Public Health do? -Why should I care?
4	Identity & Self Talk	Toilet Paper Mummies	Dove Beauty Sketches	What contributes to the way you speak to yourself and others?
5	Faculty Presentation: Social Epidemiology	Presentation and Discussion		Learn about social determinants of Health and Health Equity. -What is Health Equity? -What are the causes of inequities in health? -What are social determinants of health? -What is being done to address health inequities?
6	Emotional Intelligence	-EI Survey -2 Minute		-Are you aware of yourself and your emotions?

Session	Topic	Activity	Videos & Links	Discussion
		Conversations -Noticing Game		
7	Faculty Presentation: Epidemiology	Presentation and Discussion		Give a general overview of the field. -What is Epidemiology? -Epidemiologic Triangle -What is the role of an epidemiologist during a pandemic? -Infectious vs non-infectious disease
8	Discrimination	Strengths on Your Back	Judging Others (blue eye/brown eye experiment)	-Where have you seen your own strengths?
9	Faculty Presentation: Public Health Policy	-Presentation and Discussion -PBL in groups		Students learn about the policies that address the health of populations. They learn about the decision making process and how they can get involved. -What is Health Policy? -What is the function of health policy and how is it developed? -How do different populations experience health policy?
10	Mental health	Video	Netflix: The Mind Explained - Anxiety	Discussion on mental health strategies, bullying

Figure 1

Pathways to Public Health Information Session



Black students in the TDSB were invited to attend an information session (see Figure 1) on March 1st, 2023. During the session, representatives from the Dalla Lana Public Health and Graduation Coaches at the Centre of Excellence provided information including but not limited to the objectives/goals of the program, content of the sessions, key timelines and logistics.

Literature Review

In order to meet the health needs of a culturally diverse population, the Canadian public health workforce must continue on its path to being ethnically diversified to provide culturally competent care (Cleaver et al., 2016; Zghal et al., 2021). Existing research shows that there is a low representation of Black people in the health sector as well as in key leadership positions across health institutions and systems (Williams & Wyatt, 2015). The lack of Black public health professions is a contributing factor to the high rates of preventable health disparities in the Black Canadian community. For instance, studies have shown that racial/ethnic communities bear the highest disparities across multiple health outcomes in comparison to their counterparts (Pan-Canadian Health Inequalities Data Tool, 2017; Public Health Agency of Canada,

2020; Williams & Wyatt, 2015). Research further shows that Black people are more likely to seek medical and health services from individuals of the same race or ethnicity (Saddler et al., 2021; Hill et al., 2018; Cooper et al., 2003) due to the systemic discrimination and under-treatment in hospitals and other healthcare systems (Nnorom et al., 2019; Williams & Wyatt, 2015). Thus, it is critical to increase the representation of Black professions in the multiple systems and institutions within the Canadian Public Health sector.

Experiences of Black Students in TDSB and STEM

Overview: Experiences of Black Students in TDSB

The schooling experiences of Black students in TDSB reveals that they encounter institutional anti-Black racism (McPherson, 2020; James & Turner, 2017; Maynard, 2017; James, 2012; Dei, 2008). The barriers and challenges that Black students face include streaming, disproportionate rates of school discipline, over surveillance, low expectations by teachers and being pushed out of schools (Glogowski & Rakoff, 2019; James & Turner, 2017; Ontario Alliance of Black School Educators, 2015). For example, Black youth had a higher rate of dropping out of high school (20%) in comparison to their White (11%) peers (James & Turner, 2017). The dropout rates of Black students are further compounded by school disciplinary policies and practices that disproportionately impact Black youth. TDSB data from 2011-2016 revealed that 307 students were expelled from schools and nearly half (48%) of the pupils self-identified as Black (Zheng & De Jesus, 2017). The overlap between Black youth and school disciplinary is further critical because the graduation outcome of expelled students is low. Out of the 307 expelled students, 209 had graduation outcomes yet more than half (58%) dropped out or their future designation was not known to school administrators while 24% graduated with an Ontario Secondary School Diploma (Zheng & De Jesus, 2017). While the report does not break down the racial demographics of students who dropped out, there is a high correlation given that nearly half of the expelled students self-identified as Black.

Further, a report by Pathways to Education (2019), that examined the barriers Black secondary students encountered, identified mistrust, low expectations and streaming by educators as critical factors to engagement and academic success. Black students were more likely to be streamed into applied courses through the discouragement of pursuing academic courses and pushed to focus on sports (Glogowski & Rakoff, 2019; James & Turner, 2017; Maynard, 2017; James, 2012). For instance, Black students (39%) were twice as likely to be in applied courses compared

to their White (16%) and other racialized (18%) peers (James & Turner, 2017). Another study by Parekh et al (2021), which highlights an examination of TDSB Grade 9 cohort data from 2013 to 2018, corroborated research that has connected streaming to students racial identity and socioeconomic demographics rather than their academic capabilities (Glogowski & Rakoff, 2019; James & Turner, 2017). For example, Black youth in Applied courses (26%) were twice as the general student population (13%) while over half of students (51%) came from low-income households (Parekh et al., 2021).

The differential treatments, academic streaming and stereotyping of Black students have been ongoingly challenged and disrupted by Black students, families and community members (Munroe et al., 2022b). In response to Black communities advocacy, TDSB created the Centre of Excellence in 2020. The aim of the Centre is to "dismantle anti-Black racism within the school board and improve both experiences and outcomes for Black students" (TDSB, n.d., p. 12). The Centre of Excellence offers Black students a variety of culturally responsive and relevant programs to engage them, and provide opportunities for mentorship and networking. For example, Black Aviation Professionals Network (BAPN) provides Black students with opportunities for experiential learning with Black professionals in the industry to promote aviation careers. There have also been other programs formed to help Black families navigate the Ontario education system as a result of ongoing advocacy by Black families and communities and TDSB reports that highlighted the institutional inequities that Black students experience (CBC News, 2021). The provincial government is funding the Student and Family Advocate program which is a Black community based programming designed to offer Black families with support navigating the education system (Parents of Black Children, 2023; CBC News, 2021). These changes, at TDSB and provincial government, are important steps to an equitable education system that have been initiated and advocated for by Black families, communities and Black-led organizations.

Barriers to Accessing STEM Programs

In 2014, TDSB developed a K-12 STEM strategy (2014b) that is "a transdisciplinary approach to inquiry and problem-based learning...to foster collaboration, creativity, and innovation to prepare students to participate in a rapidly changing, technological and interconnected world" (as cited in Sinay et al., 2016, p. 36). One of the objectives for the TDSB STEM strategy is to "challenge the under-representation of historically marginalized communities in STEM fields by removing existing barriers to engagement and achievement" (TDSB, 2015, p. 1). K-12 STEM strategy is crucial as scholars have identified that the promotion and support of students in STEM at a young age is important for the role it plays in the development of

their STEM identity and capabilities (Kanaki & Kalogiannakis, 2022; LeBlanc & Loyd, 2022; Tandrayen-Ragoobur & Gokulsing, 2022). LeBlanc and Loyd (2022) state that STEM identity starts to develop in childhood and continues through adolescence. Children's early STEM-based experiences assists them to begin to understand what STEM careers are and who can be a STEM professional (LeBlanc & Loyd, 2022). In other words, STEM identity is connected to the development of STEM related skills and a sense of belonging to a STEM community (LeBlanc & Loyd, 2022).

However, for Black students, this early development is impacted by the Eurocentric nature of the educational system, educators' low expectation and streaming to non-academic courses and specifically, away from STEM (Black Professionals in Tech Network, 2022; Glogowski & Rakoff, 2019; James & Turner, 2017; James, 2012). The streaming of Black students from STEM and academic to applied courses have long-term impacts such as lower graduation rates and enrollment in post-secondary institutions in comparison to peers in Academic programs (Glogowski & Rakoff, 2019; James & Turner, 2017). Moreover, lack of sense of belonging and knowledge about scientific communities, academic supports, and access to mentors, especially Black teachers and STEM professionals that can serve as representation, are further exclusionary factors that keep Black students away from STEM classes, post-secondary and careers (Stolle-McAllister, 2011; Black Professionals in Tech Network, 2022; McGee, 2018; Parsons & Morton, 2022). For example, before Ontario medical schools launched alternative application processes for Black students, each medical class had between 1-2% of medical students who self-identified as African or Caribbean (MacLeod, 2019).

According to the Ontario Curriculum (2022), the objective of secondary schools is to support the learning of students while offering opportunities for them to select programs that match their interests and capabilities for success. The document further identifies the importance of STEM education as an important aspect of the curriculum and schooling because students "develop the transferable skills that they need to meet the demands of today's global economy and society, and to become scientifically literate citizens" (Ontario Curriculum, 2022, p. 6). Yet, for Black students, the institutional barriers that they encounter at secondary schools continue in their pursuit of post-secondary education in the healthcare profession and other STEM disciplines. Black post-secondary students experience isolation, low performance expectations by faculty, lack of affinity spaces and mentors and microaggressions (Ewers et al., 2022; McGee, 2018; Stolle-McAllister, 2011). Ewers et al. (2022) study examined the experiences of people of African descent in Nova Scotia in health professions. The study highlighted the challenges and racial microaggressions that participants encountered as the only or one of few Black students in the program (Ewers et al.,

2022). Given the lack of representation of Black health professionals, and broadly STEM, mentorship, support and a sense of belonging in a STEM community is a barrier that makes retention a challenge (Huang et al., 2021). These barriers and challenges are leading to a dearth of qualified STEM Black graduates at every stage and inequalities in STEM professions, and specifically the healthcare field (York University, 2023; Ewers et al., 2022). Hence, there is an urgent need, and call, to nourish and promote Black health, as well as STEM identities from an earlier age by eliminating institutional barriers and structural challenges (Black Experiences in Health Care Symposium, 2020; Dutton, 2018).

Factors that Influence Black Students Success in Public Health and STEM Fields

Research and Black community members that have examined institutional barriers and challenges to STEM for Black students have also provided critical factors that stimulates their success in STEM education and fields (Morton & Smith-Mutegi, 2022; Parsons & Morton, 2022; Huang et al., 2021; Black Experiences in Health Care Symposium, 2020; Cedillo, 2018; McGee, 2018; Shooter et al., 2015). Namely, this review will delve into mentorship opportunities, access to mentors, culturally relevant pedagogies and practices, a sense of belonging and alternative programs to foster Black students' STEM identities and pathways to STEM careers such as public health.

Mentorship and Access to Mentors

Mentorship, access to mentors and representation, are important for Black students navigating an Eurocentric education system that includes having minimal to no Black teachers (Glogowski & Rakoff, 2019; James & Turner, 2017; Maynard, 2017; Ontario Alliance of Black School Educators, 2015; James, 2012; Dei, 2008). Research has shown that mentorship, particularly with mentors and role models who have similar categories of identities, plays an important role in promoting STEM education and careers to students underrepresented in STEM such as Black pupils (Huang et al., 2021; McGee, 2018; Shooter et al., 2015). For instance, McGee's (2018) survey and discussion on mentorship for underrepresented students in STEM, revealed that mentors with similar identities (e.g., race, gender) are able to provide emotional and psychosocial support, help them to feel acknowledged, and to feel a better sense of trust. These forms of support are significant for Black students who frequently experience institutional barriers, isolation, lack academic and social assistance, which negatively impacts their retention.

Mentorship and role models are also important for Black students to envision themselves in professions, such as public health, that historically and currently have an underrepresentation of Black people. Darling et al (2008) model of identity integration in relation to professional attainment postulates that students who perceive that their identities (e.g., race, gender, class) are in conflict with specific professions are more likely to achieve less than those who feel a compatibility (as cited in McGee, 2018). Hence, access to Black STEM educators, mentors and role models is significant to eliminating the incompatibility that is reinforced by the whiteness within STEM education and profession. For example, a report for Black students in the Pathways to Black Veterinary Medicine program found that Black facilitators and mentors were important factors for their success (Munroe et al., 2022a). Moreover, students reported that the facilitators and mentors provided them with resources and valuable information such as the veterinary medicine application process and their experiences as Black veterinary professionals (Munroe et al., 2022a). This is critical as positive engagements with Black mentors and role models, who develop social and academic capital, plays an important role in promoting STEM education and careers for Black students.

Culturally Relevant Pedagogies (CRP) and Practices

Historically and currently, identities associated with STEM and the norms of success have been reproduced as being only embodied by white cis-heterosexual middle-class men (Hing, 2022; MacLeod, 2019). Simultaneously, STEM is reproduced as being objective, neutral and based on meritocracy which sustains the biases and inequalities in STEM education and careers (Hing, 2022). This is important because Eurocentric curriculum and STEM narratives are utilized to sustain the hegemonic practices of whiteness in STEM. These factors contribute to the dissonance between the current K-12 STEM pedagogy as well as practices and culturally relevant knowledge for Black students. Black students lack a connection between their experiences as well as communities and STEM content, including the methods and practices of teaching STEM (Thevenot, 2021; Priddie, 2020). While CRP is yet to be widely utilized in STEM education, researchers have recommended culturally relevant pedagogies and practices as a way to address institutional barriers and challenges that sustains the dissonance between STEM education and Black students (Cedillo, 2018; Ewers et al., 2022; Howard et al., 2021; Morton & Smith-Mutegi, 2022; Parsons & Morton, 2022; Priddie, 2020; Seriki, 2018; Thevenot, 2021).

Culturally relevant pedagogy (CRP), coined by Gloria Ladson-Billings, focuses on students learning, achievement and supports to affirm their cultural identity while

developing their critical consciousness to challenge societal, including the education system, inequities (Thevenot, 2021; Henry, 2017). The tenets of CRP operate in conjunction, meaning educators must focus on and use all of them in their pedagogy and practices. CRP is also relevant and responsive to Black students' intersectional identities (e.g., Black girls) so that all Black students' learning, needs, interests and success is supported for promoting STEM (Amdemichael, 2022; Thevenot, 2021). CRP pedagogies situates Black students' identities in STEM education as competent learners who are compatible with STEM careers which in turn cultivates their STEM identity (Parsons & Morton, 2022; Thevenot, 2021). CRP is also critical for the development of a STEM identity for Black students as it connects STEM content to their lives, families and communities (Thevenot, 2021). Real world impact of STEM on their communities reveals to Black students the practical application of STEM in their everyday lives (Amdemichael, 2022). Subsequently, CRP in STEM education enables Black students to be agents to better understand and resolve issues in their community and society. STEM pedagogies and practices that connect to Black students' lived experiences while validating their knowledge contributes to them having the skills and aspiration to seek a deeper comprehension of STEM and strengthens their motivation to pursue STEM degrees and careers (Morton & Smith-Mutegi, 2022).

To foster optimal environments for Black youth to succeed in STEM, CRP encourages educators to cultivate r teaching pedagogies and practices that affirm to Black students' learning styles and strategies (Parsons & Morton, 2022; Thevenot, 2021; Seriki, 2018). For instance, Joseph et al. (2019) research on Black girls' experiences in mathematics classrooms revealed that they are collective learners who valued the sharing of power with their peers and mathematics teachers. In particular, Black students are looking for an equitable, caring, and supportive relationship with teachers (Parsons & Morton, 2022; Thevenot, 2021). Therefore, collaborative learning strategies are important for engaging and stimulating Black students (Howard et al., 2021; Priddie, 2020; Joseph et al., 2019). Moreover, the use of inquiry based and hands-on learning have been critical for promoting positive STEM identities for Black students and situating themselves as equals to peers in scientific discourse (Amdemichael, 2022; Parsons & Morton, 2022; Howard et al., 2021; Cedillo, 2018). Yet, educators overwhelmingly continue to prioritize teacher-centered instruction that encourages passive learning which deters Black students interest and engagement from STEM (Parsons & Morton, 2022). Thus, culturally relevant pedagogies and practices in STEM education is important to eliminating harmful curriculum and practices that adversely impact Black students' identity, and educational outcome.

Sense of Belonging

Research has shown that Black students consistently report feeling less sense of belonging in STEM in comparison to their peers (Collins-Puri, 2023; Hansen et al., 2023; Rainey et al., 2018). For example, Black girls and young women in mathematics and science classrooms reported feeling disengaged and not belonging because of the intersectional marginalization they experienced (Morton & Smith-Mutegi, 2022). Gendered anti-Black racism that Black girls encounter in K-12 education includes the perception by teachers that their academic capabilities are average even when they exhibit high abilities (Neal-Jackson, 2018).

Hence, a sense of belonging is important for Black students as the culture of STEM education and careers continue to be unwelcoming spaces that pose many barriers for them to feel attached (Collins-Puri, 2023; Hansen et al., 2023; Ong et al., 2018; Rainey et al., 2018). According to Goodenow (1993), a sense of belonging is students feeling accepted, valued, included and encouraged in classrooms by teachers and peers (as cited in Collins-Puri, 2023; Hansen et al., 2023; Rainey et al., 2018). Further, Strayhorn (2018) asserts that sense of belonging correlates to support received, feeling connected and mattering to the school community (as cited in Hansen et al., 2023). Sense of belonging is crucial because it plays an important role in the academic performance, success and retention of Black students in STEM education and pursuing STEM careers (Hansen et al., 2023). For instance, researchers exploring belonging with Black and Latino students from a STEM middle school found that they rated themselves as more engaged when they regarded teachers' practices as offering them opportunities to belong in classrooms (Oleniacz, 2022). Thus, it is imperative for educators and school administrators to cultivate a sense of belonging so that Black students, in all their multiple and intersecting identities, in STEM are better supported and feel connected.

Alternative Programs for Fostering STEM Identities & Pathways to STEM Careers

A variety of alternative programs to traditional schooling have achieved distinction for their potential in helping to promote educational success, explore diverse interests and develop social, emotional and life skills for children and youth (Shooter et al., 2015; Krishnamurthi et al., 2014; Sahin et al., 2014). To expand students’ interest in STEM and foster STEM literacy, many programs have been developed and implemented. These programs can provide opportunities and supportive environments, especially for Black students, that assist with the development and furthering of STEM

identities, retention in STEM courses and pathways to STEM post-secondary education and careers (Morton & Smith Mutegi, 2022; Shooter et al., 2015; Sahin et al., 2014). These initiatives are critical for countering the barriers and challenges, discussed above in experiences of Black students in TDSB and STEM section, that Black young people encounter in their schooling experiences.

Research has shown that informal STEM learning (e.g., after school programs) is influential in developing students' STEM identities, achievement and increased their interest in STEM careers (Krishnamurthi et al., 2014; Morton & Smith-Mutegi, 2022; Shooter et al., 2015). For instance, Kerr and Robinson (2014) found that girls of color's interest in exploring STEM careers, attainment and confidence increased after their participation in informal STEM learning (as cited in Morton & Smith-Mutegi, 2022). These findings are important as Black students often find themselves in classrooms and schools that do not cultivate their STEM interests and identities. Having access to STEM programs rooted in Black students' social and cultural contexts, as well as intersecting identities, are critical for a STEM culture and climate that is welcoming. For instance, Barton and Tan's (2010) study on the relationship between science learning, science identity and students' agency highlighted the importance of offering opportunities for youth to implement STEM agency in socially appropriate milieu so that they can develop a STEM identity (as cited in Krishnamurthi et al., 2014).

It is also important to note that research has shown the importance of school-family-community engagement to support Black students' engagement in STEM (Morton & Smith-Mutegi, 2022; Sinay et al., 2016; Krishnamurthi et al., 2014; Sahin et al., 2014). School-family-community partnership in programming offers students opportunities to engage in hands-on STEM learning that is relevant to their lived experience with Black mentors and role models. Furthermore, it cultivates their interest in STEM and builds their STEM skills which in turn raises their social and academic capital for success (Shooter et al., 2015; Morton & Smith-Mutegi, 2022; Huang et al., 2021). For instance, Huang et al. 's (2021) review of literature on factors that influence Black American students' retention in STEM found that most programs offer multi-faceted programming that include social, financial and academic assistance and resources. The program also established and sustained a community to cultivate students' sense of belonging and connectedness (Huang et al., 2021). Community, relationships, resources and Black mentors and role models are important as they play a key role in countering the disconnection and lack of belonging Black students experience in their STEM classrooms and schools.

Methods

The data presented in this report highlights key themes from the 2023 Pathways to Public Health: Dalla Lana School of Public Health survey completed by Black students who participated in the program. Students were asked to provide feedback on their engagement with STEM related courses in their schools, reasons for their participation in the program and their assessment of Pathways to Public Health. Students were also asked about how they heard of the program and their suggestions for improving it. The survey included both closed and open-ended questions for students to provide answers in their own words. The survey included open-ended questions that allowed students to share their overall experiences, giving them an opportunity to have their voices heard and valued. These open-ended responses enabled the research team to contextualize the close-ended inquiries. A total of eighteen (n=18) students completed the survey.

Findings

Students' Demographic Information

Figure 2 shows the grade level of students participating in the program, which was offered to students from Grades 10 to 12. The majority of students (50%) were in Grade 11 while 27.8% were in Grade 10 and the remaining (22.2%) students were in Grade 12.

Figure 2

Students' Grade Level

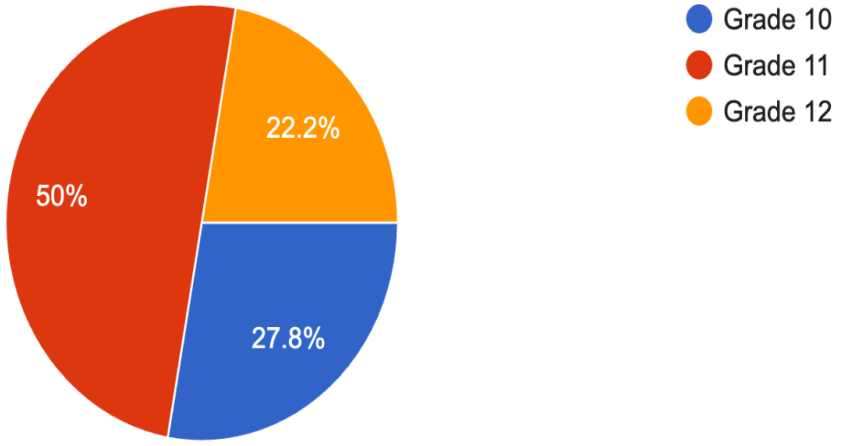
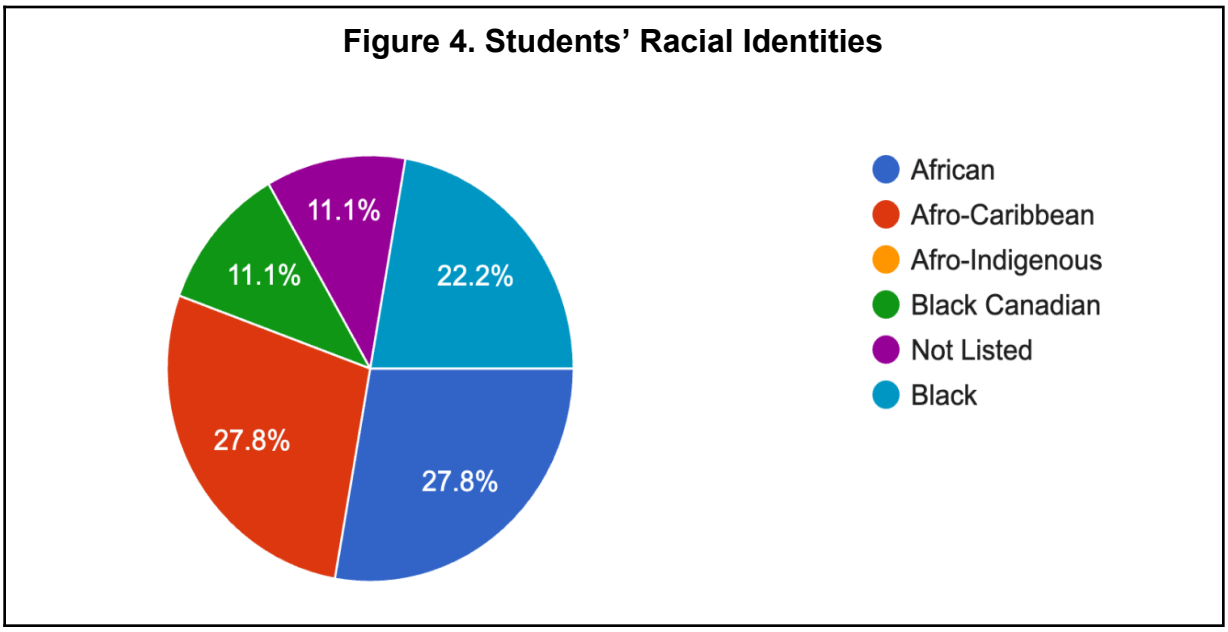


Figure 3 shows the racial identities of the participating students. Of the total number of Black students, 27.8% self-identified as African and Afro-Caribbean for a combined percentage of 55.6%. The next racial identity that students identified with is Black (22.2%) while 11.1% listed Black Canadian as their racial identification. The remaining number of students (11.1%) chose to not list their racial identity.

Figure 3

Students' Racial Identities



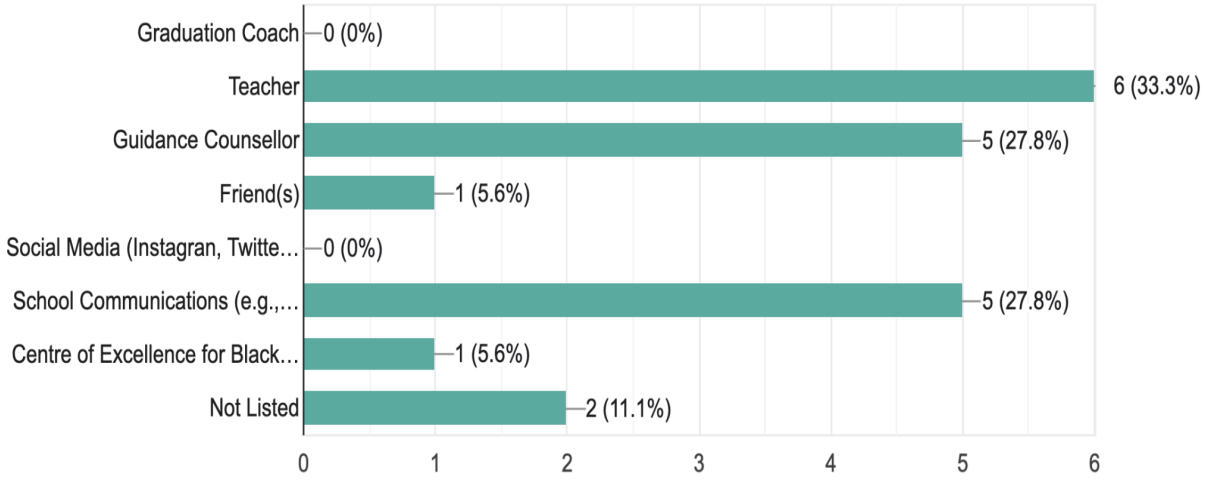
Reasons for Participating in the Program

First Hand Knowledge About the Program

Students were asked to share how they first heard about the program. As indicated in Figure 4 (below), students reported that they heard about the program from teachers (33.3%), followed by guidance counselors and school communications (e.g., school emails and newsletters) who tied at 27.8%. The remaining categories that students reported as raising their awareness about the program include friends (5.6%), the Centre of Excellence (5.6%) and not listed (11.1%). For not listed, students listed social workers and parents/caregivers as being the first to let them know about the program. Figure 4 below provides a statistical overview of the data on how students heard about the program.

Figure 4

How did you hear about Pathways to Public Health: Dalla Lana School of Public Health Program?

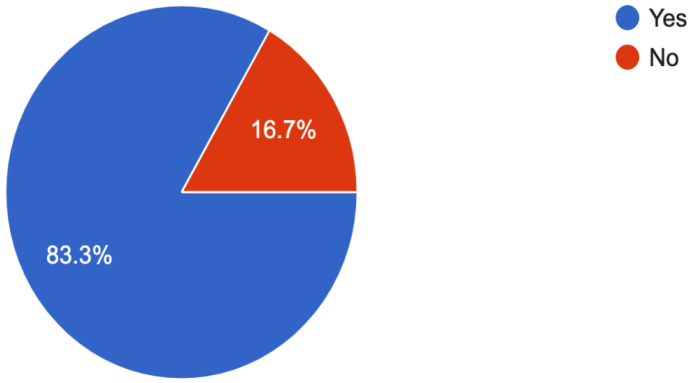


Information Session

In terms of attendance for the information session that was held on March 1st, 2023, majority of the student participants (83.3%) attended while 16.7% responded that they did not. Figure 5 below offers statistical analysis regarding students' attendance at the information session.

Figure 5

Did you attend Pathways to Public Health: Dalla Lana School of Public Health Program Information Session held on March 1st, 2023?

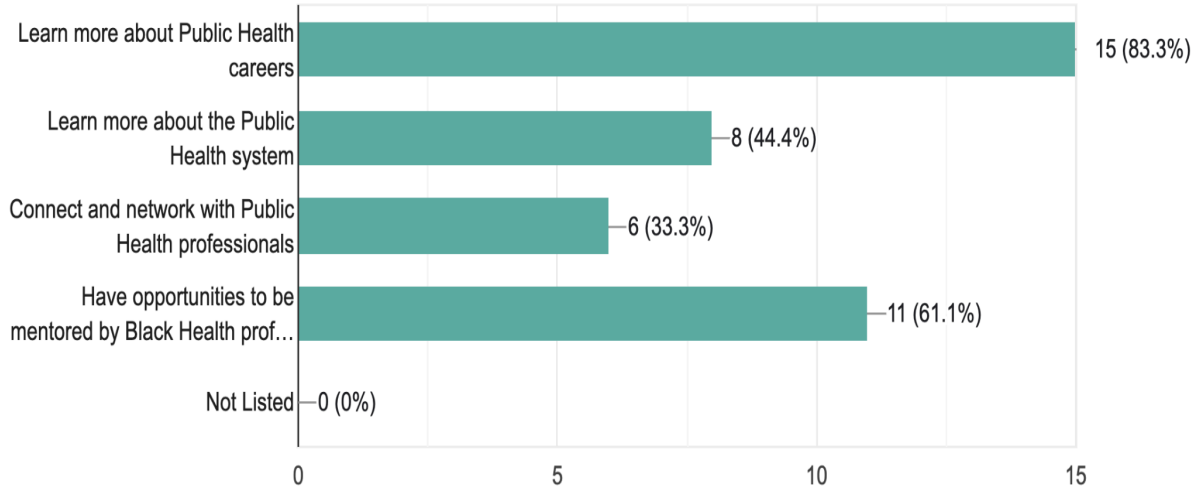


Students Reasons for Participating in the Program

Participating students were motivated to join the program because of their interest in Public Health and opportunities to connect with Black professional mentors. Majority of the students (83.3%) reported learning more about Public Health careers as a significant reason for participating in the program, followed by having opportunities to be mentored by Black health professionals (61.1%). The data also shows that students joined the program to learn more about the Public Health system (44.4%) as well as connecting and networking with Public Health professionals (33.3%). Figure 6 below shows the statistical overview of students' reasons for participating in the program.

Figure 6

What were your reasons for participating in Pathways to Public Health: Dalla Lana School of Public Health Program?



Students' Knowledge and Experiences with STEM in their School-Community

STEM Courses Taken by Students

Most of the students, especially those in Grades 11 and 12, were taking courses related to the natural sciences such as biology, physics and chemistry. A smaller group of students were taking courses related to mathematics such as Grade 12 calculus and vectors as well as Grade 12 advanced functions. Only two students identified taking or planning to take social sciences courses which included introduction to psychology, anthropology and sociology. None of the participating students reported taking courses related to the other disciplines within STEM such as technology and engineering.

> "Grade 12 Physics, Grade 12 Calculus and Vectors, Grade 12 Advanced functions,Grade 12 Biology, Grade 12 Chemistry." (Grade 12 student)

> “Chemistry, Physics, advanced function and introduction to psychology, anthropology and sociology.” (Grade 11 student)

> “Intro to psych, plan on taking calculus and advanced functions.” (Grade 11 student)

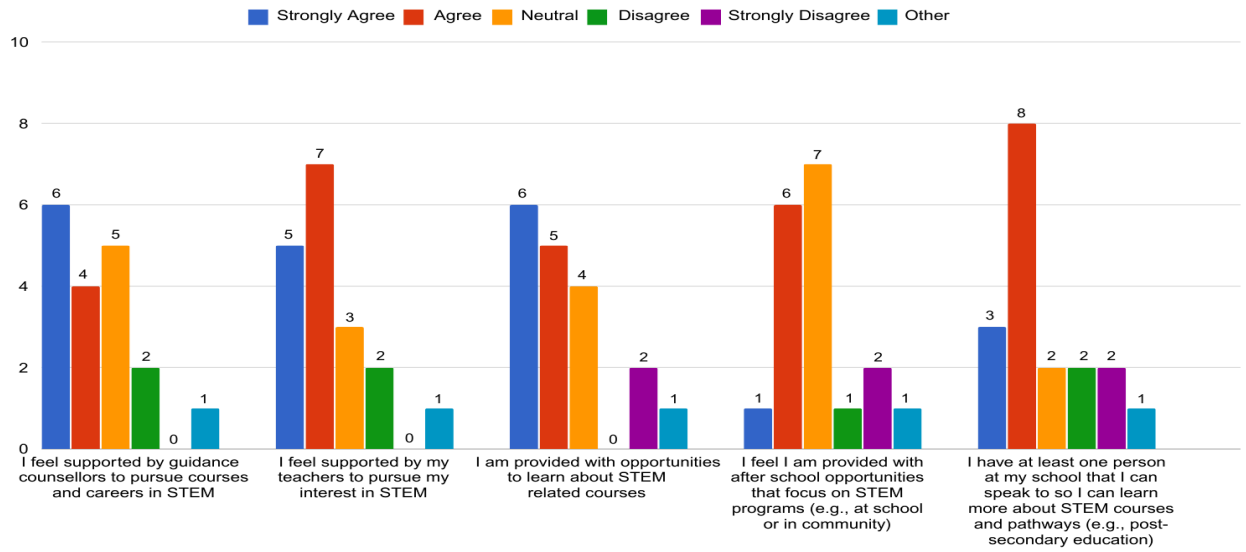
Feeling Supported by Schools

Another area that was examined in this research was students' experience with feeling and having support in their schools in relation to their interest and pursuit of STEM. When asked if they feel supported by guidance counselors in their schools to pursue courses and careers in STEM, students responded in the positive (6 strongly agreed and 4 agreed) while 5 of them selected neutral and 2 disagreed (see Figure 7). Students also responded positively, 5 strongly agreed and 7 agreed, about receiving support from teachers to pursue their interest in STEM. Students were asked to indicate whether they were provided with opportunities that further promote their interest in STEM. Students agreed that their schools provided them with opportunities to learn about STEM related courses (6 strongly agreed and 5 agreed) while the remaining respondents selected neutral (4), strongly disagreed (1) and other (1).

However, only 7 students (1 strongly agreed and 6 agreed) responded that they were provided with after school opportunities that focus on STEM programs while seven selected neutral and the remaining respondents alternated between disagree (1), strongly disagreed (2) and other (1). Lastly, in regard to having access to an adult at their school that they can talk to about STEM courses and pathways (e.g., post-secondary education), majority of students agreed (3 strongly agreed and 8 agreed). Figure 7 below provides a statistical description of how students felt supported by schools and teachers to pursue their interest in STEM.

Figure 7

Do you feel supported by your school in promoting your interest in STEM?

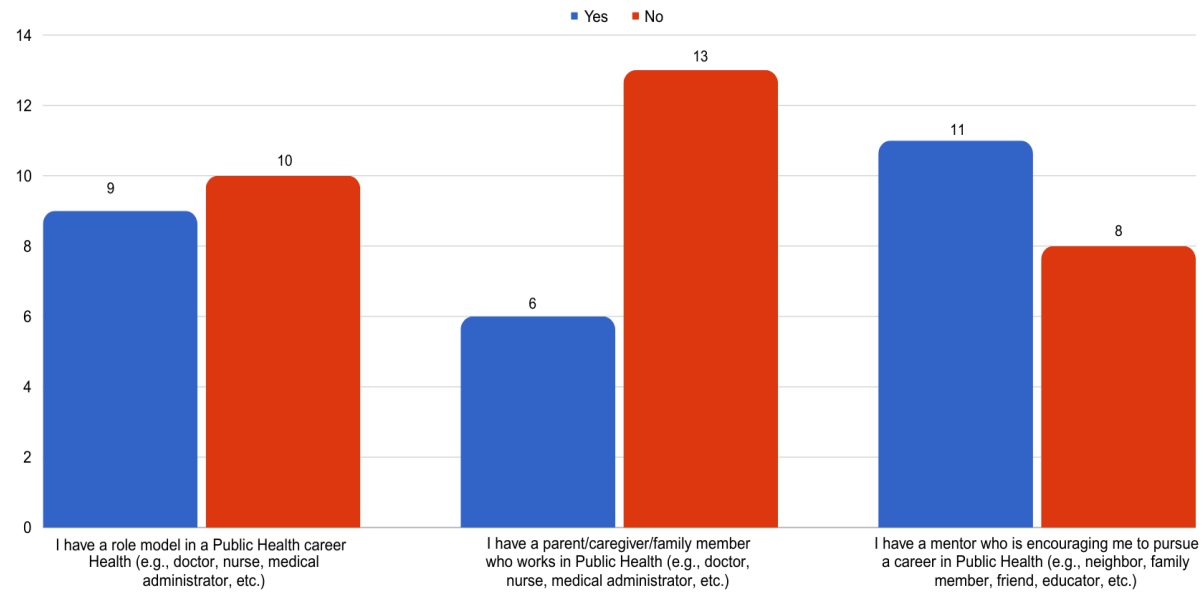


Access to Mentorship and Role Models

Access to mentors and role models is crucial to the promotion of a STEM identity and yet lacking in students' lives (refer to Figure 8). For instance, the majority of students (13) responded that they do not have access to a parent, caregiver or family member who works in public health (e.g., doctor, nurse, medical administrator). Further, 10 students stated that they do not have a role model in a public health career. Yet, many students (11) indicated that they have a mentor in their life who is encouraging them to pursue their career interest in public health. Figure 8 below is a statistical overview of whether students have access to mentorship and role models in their lives which includes their family, community and school.

Figure 8

Access to Mentorship and Role Models

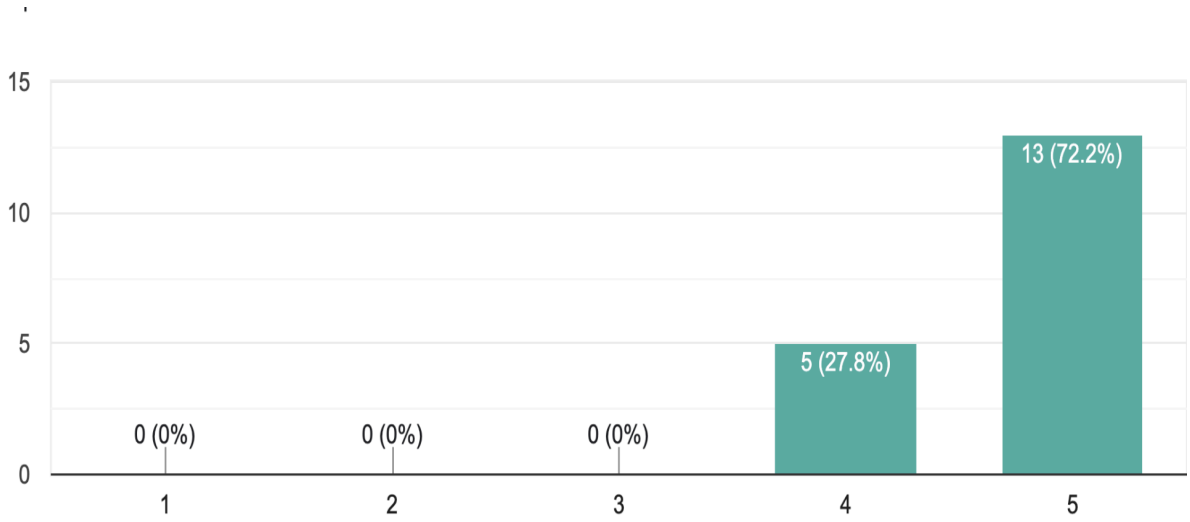


Black Students' Experience with Pathway to Public Health: Dalla Lana School of Public Health Program

Overall Experience in the Program

In regards to overall experience with the program, the data shows that all the students who participated in the program had a positive experience. The analysis showed that 72.2% of students were very satisfied with the program while 27.8% were satisfied. Figure 9 below offers a statistical representation of students' overall experience/level of satisfaction in the program.

Figure 9: Participants Overall Experience with the Program



Also, many students reported that the program was a safe and welcoming space. Below are some anecdotes from students who participated in the program.

> *"*A comforting and open space for all Black students to talk to each other, while learning about public health." (Grade 11 student)

> "I would say the experience was comfortable. I enjoyed the safe space vibe the program gave off." (Grade 11 student)

> "I would say that Dalla Lana is a welcoming and safe space where you can openly discuss and grow your knowledge on public health and its pathways while actively engaging in conversation surrounding what it's like being black person in society." (Grade 12 student)

The safe and welcoming space cultivated by the program facilitators was an identity-affirming environment for Black students. Same-race peers and program facilitators alongside with the centering of public health in the lives of Black people and communities, making the learning relevant to them and their lives, played a central role in teaching about and affirming Black students developing STEM identities. Below are some anecdotes from students about the experience of being in a program meant for Black students.

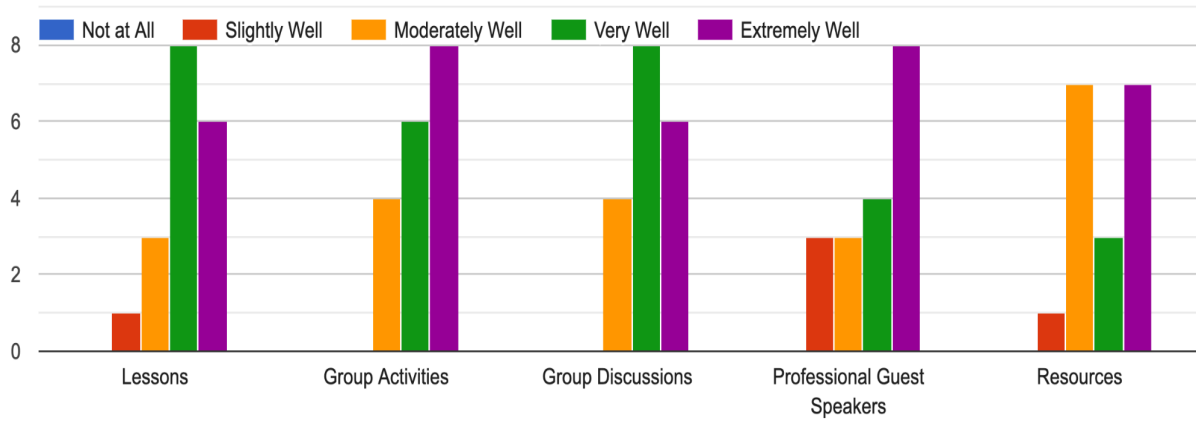
> "It was an amazing way to connect to other black students who were passionate about the social issues and career path that I was." (Grade 11 student)

> I would say it's an interesting experience to be amongst black voices trying to learn the same things as you. Different issues are taken into consideration and worked on in a respectful manner. All in all, [a] great opportunity." (Grade 12 student)

Additionally, the range of activities that the program engaged in contributed to the overall satisfaction that students expressed (refer to Figure 10). For instance, group activities and professional guest speakers were highly rated as being extremely well helpful (8) to the students learning about Public Health.

Figure 10

How Helpful the Following Activities were for Learning



In an open-ended question to describe their experience, students stated that the program was informative and contributed to an enhanced comprehension about public health and the variety of careers within the sector. For some students, their understanding of public health prior to their participation in the program was limited to hospitals and doctors as well as nurses for public health professions. Hence, students' more enhanced comprehension of the variety of careers in public health and opportunities in health systems was a significant benefit of the program for them. Below are some anecdotes from students who participated in the program.

> "Informative. I learned a lot here, and was able to explore the different careers in public health." (Grade 10 student)

> "I thoroughly enjoyed the program! I was worried that a career in health would result in a lifetime in the hospital, which I hate. The program conveyed that there were alternative pathways in health for me. I had no idea an epidemiologist could work in an office, or that bioethics could allow me to work in law simultaneously." (Grade 12 student)

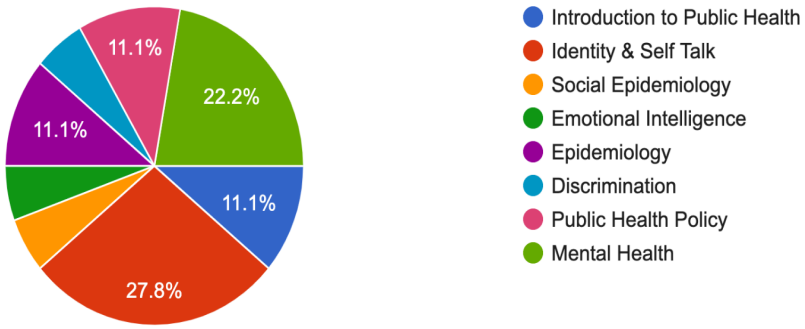
> "I now understand that public health is not limited to doctors and nurses only." (Grade 10 student)

> "I now understand that public health is an amalgamation of all professions and that its aspects can be used to protect, prevent and research on a city-wide scale." (Grade 12 student)

Eight respondents also reported that lessons and group discussions were "very well" for enhancing their learning within the program about public health concepts and pathways to careers (refer to Figure 10 above). For example, students identified 'Identity and Self Talk" (27.8%) as their favorite topic followed by "Mental Health" (22.2%), "Introduction to Public Health, Public Health Policy and Epidemiology" (11.1%) and "Social Epidemiology, Emotional Intelligence and Discrimination" (5.6%). Figure 11 below provides a statistical representation of the students favorite topics in the program.

Figure 11

Favorite Topics in the Program



In regards to the helpfulness of resources in learning about public health, students alternated between extremely and moderately well (refer to Figure 10). These multifaceted approaches to teaching, such as group discussions and activity-based learning, supported students' capacities for deeper understanding of public health

concepts, principles and the relationship to themselves and communities. Below are some anecdotes from students who participated in the program.

> “I definitely enjoyed all of the topics. I wish I could have chosen more options, but the introduction to public health was really interesting because I’ve never really been taught about public health the way I was in the program.” (Grade 10 student)

> “Along with mental health, a close second, social epidemiology sounded like a career path I could actually take and be content in. It was wonderful!” (Grade 12 student)

> “It introduced me to how public health affect[s] our environment and how public health is very important.” (Grade 10 student)

Facilitators Support and Mentorship

The survey results also determined that program facilitators support and mentorship were important in supporting Black students’ sense of belonging in Public Health and success in the program. These findings are important in acquiring understanding into the protective factors, such as supports, that can be utilized to promote Black students' STEM identity and participation. Figure 12 shows how students felt that facilitators cared about their success, supported and encouraged them to pursue their goals and provided them with further opportunities. For instance, 14 respondents strongly agreed with the statement that program facilitators were supportive and encouraging. Thirteen (13) students positively rated (strongly agreed) the statements that facilitators cared about their progress and success in the program.

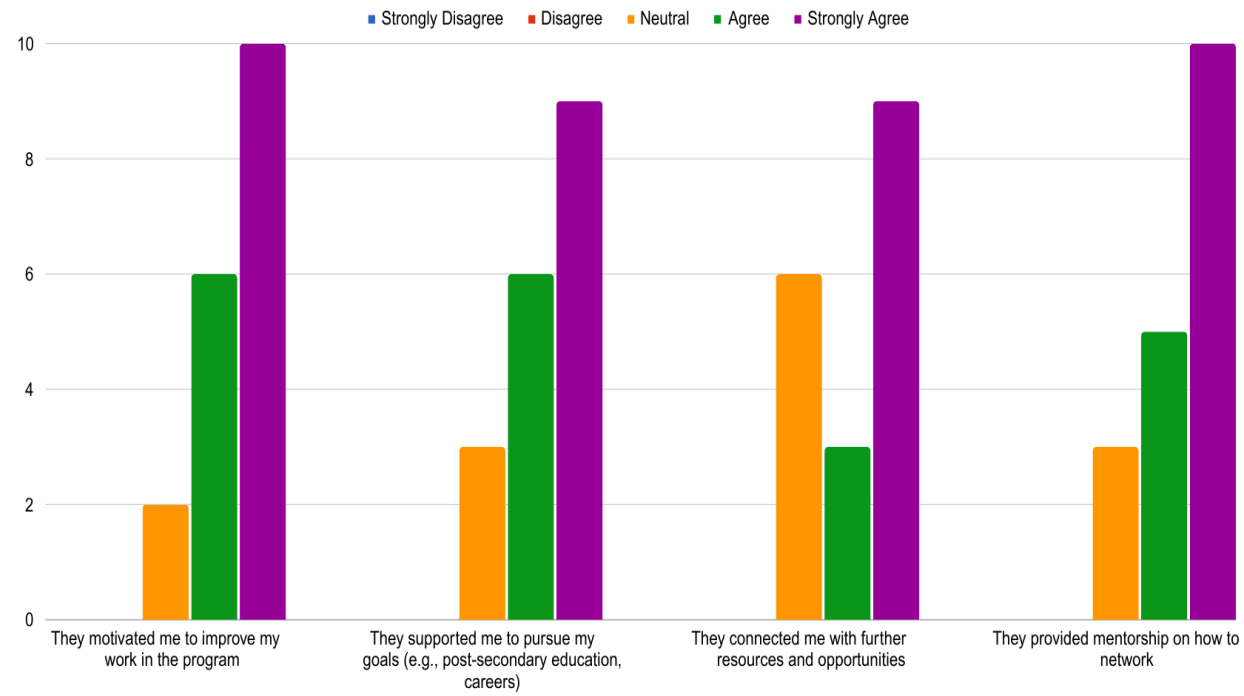
Figure 12

Engagement with the Program Facilitators

Furthermore, the majority of the students acknowledged that the care and support provided included facilitators motivating them to do better in the program. For example, 10 strongly agreed while 6 agreed that facilitators motivated them to improve their work in the program. The support and motivation also extended to students' interest past secondary education. For instance, 9 respondents strongly agreed while 6 agreed that facilitators supported them to pursue their goals of post-secondary education and career in Public Health. In addition to offering support within the program, 12 students (9 strongly agreed while 3 agreed) reported that facilitators connected them with further resources and opportunities. One of those opportunities provided was mentorship on how to network as reported by 10 students who strongly agreed and 5 who agreed.

Figure 13

Engagement with the Program Facilitators



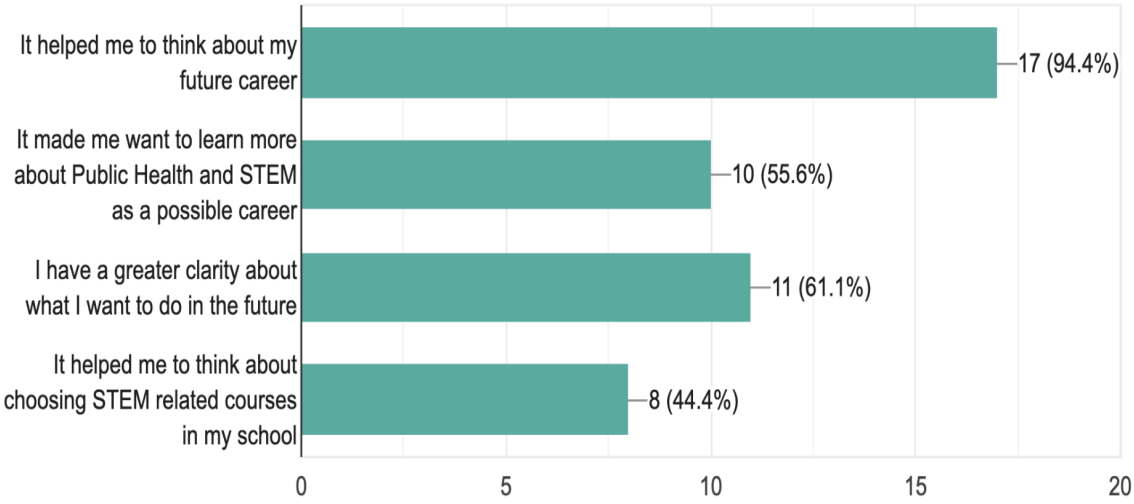
Students were also asked to report whether the facilitators created an effective learning environment with engaging lessons as well as activities. Thirteen respondents strongly agreed that the environment developed was effective for promoting their learning while 12 students strongly felt that the lessons and activities were engaging.

Aspirations for Future Career

Students were asked whether participating in the program helped them to think about and make an informed decision about pursuing a career in Public Health. Close to ninety-five percent of students reported that the program helped them to think about their future career. About 61.1% of the students gained a substantial clearness about what they want to do in the future. In relation to Public Health and STEM, 55.6% of respondents stated they wanted to learn more about careers in those fields. Figure 14 shows the breakdown of what students gained from their participation in the program.

Figure 14

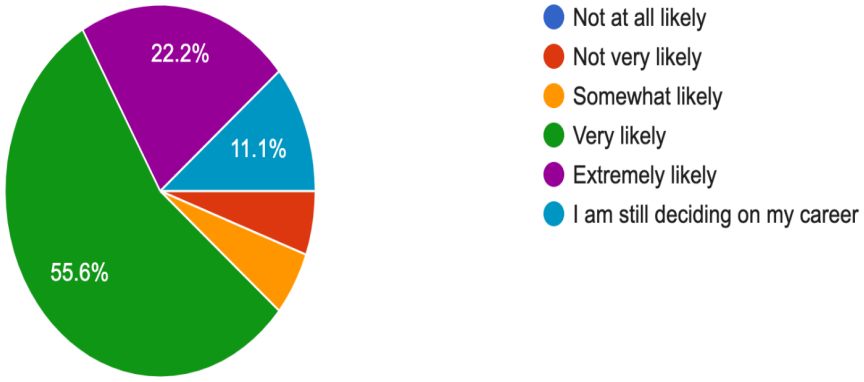
Gains Made by Students from Participating in Pathways to Public Health: Dalla Lana School of Public Health Program



Furthermore, 55.6% of students reported that they are very likely to consider a career in Public Health while 22.2% of respondents are extremely likely (refer to Figure 15). Approximately eleven percent (11.1%) of students are still deciding on their career choice while 5.6% reported that they are not very likely to consider a career in Public Health.

Figure 15

How Likely are Students to Consider a Career in Public Health After Participating in the Program?



The statistical figures for future career aspirations are also supported by anecdotes from students who participated in the program, which are listed below.

> "It helped me to think about my future career, It made me want to learn more about Public Health and STEM as a possible career, It helped me to think about choosing STEM related courses in my school." (Grade 10 student)

> "It helped me to think about my future career, I have a greater clarity about what I want to do in the future." (Grade 11 student)

> "Overall this program was a very fun one that I very much enjoyed. It helped me to think deeper about what I want to do in the future." (Grade 11 student)

Conclusion

Pathways to Public Health was introduced to provide Black students in Grades 10-12 with opportunities to connect with Black professional mentors, expand their understanding of careers within Public Health and increase pathways to post-secondary education in Public Health. To meet these objectives, Black students were immersed in weekly sessions that included specific topics, group discussions, activities, access to Public health professionals and same-race program facilitators with knowledge as well as experience in Public Health. Based on students' responses from a post-program

survey, the themes identified included overall experience in the program, facilitators support and mentorship and aspirations for future career. Students reported that they had a positive experience in the program because of the sense of belonging and affirmation of their Black identity they felt through the cultivation of a safe and welcoming environment. Feeling of belongings is crucial as research has shown that it plays an important role in Black students' engagement, success and retention in STEM education and careers (Collins-Puri, 2023; Hansen et al., 2023; Oleniacz, 2022; Rainey et al., 2018). Further, access to mentorship and role models is critical to the promotion of a STEM identity for Black students. Majority of respondents felt that the facilitators were supportive, encouraging and cared about their success. Lastly, students participation in the program translated to future career interests and aspirations in Public Health specifically and broadly STEM.

The Pathways to Public Health: Dalla Lana School of Public Health Program emphasizes the significance of offering culturally relevant pedagogies and practices and access to mentorship and role models as a counter-alternative to the institutional barriers that Black students experience within the education system. Counter-spaces, like this program, provide Black students with the opportunities and support to be successful through the fostering of their STEM identities and pathways to post-secondary education and careers in STEM.

Recommendations

The following table outlines the recommendations made by Black students who participated in the program.

Themes	Recommendations
Interactive Learning Methods	● The use of multiple interactive methods, including different platforms and tools, for learning is a valuable tool that offers students abundant opportunities to engage with the learning process. ● Varied interactive learning provides students with a comprehensive experience that includes theoretical knowledge about public health and real world situations that connects the learning to their lives (e.g., family, school and communities). ● Participating students offered the following suggestions:

Themes	Recommendations
	"The program was really engaging and fun. However, if there was more public health related games and interactions it would be great."(Grade 10 student) "A suggestion I can make about the program is perhaps involving a project." (Grade 11 student) "Have more group discussions, guest speakers are nice but wasn't that engaging in my opinion" (Grade 12 student).
Increased Knowledge about Health Science and Relationships with Mentors	● Students expressed interest in increased learning about a variety of health science programs to further develop their knowledge about a diverse field. ● Further, the importance of relationships with mentors to build students' understanding and capabilities for public health post-secondary education and careers was also identified by respondents. ● Mentors with similar identities (e.g., race, gender) have experiences and knowledge that can be utilized to build Black students social capital. ● The enhanced knowledge about an expansive public health field and social capital through relationships with mentors are critical to the acquisition of cultural capital to navigate post-secondary education and career in public health. A grade 11 student suggested that: "One suggestion I have is to explore more health sciences programs other than just Epidemiology. I understand the availability of guest speakers but it would be nice to have quick lessons on the mentors' university experiences and their job." (Grade 11 student)
Expanding the	● There was a demand for the program to be implemented

Themes	Recommendations
Program	in schools. ● This recommendation is significant given the implementation of K-12 STEM initiative by TDSB in which STEM has been found to be an equalizer yet Black students continue to experience institutional barriers. ● A culturally relevant and responsive pedagogy in STEM education is critical for fostering optimal environments for Black students to succeed in STEM. “Not necessarily, maybe bring in more guest speakers. Also promote more of this one’s and more in the future!” (Grade 11 student)

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