



Racialized Mathematics Learning Experiences of Black Undergraduate Students

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Abstract: The mathematics learning experiences of Black students in undergraduate programs present particularities that are not common to all undergraduate students. The challenges Black students encounter in their post-secondary programs reflect issues in the university environment that can significantly impact their experiences. These issues involve different domains and deserve full attention. This critical review presents emergent themes in the literature on racialized mathematics learning experiences of Black undergraduate students. Research databases, ranging from 2015 to 2022, were examined using keywords that addressed mathematics, racism, undergraduate students, and Black students' learning experiences. Canadian, United States, and international research was analyzed, and five emergent themes were identified in the literature: mathematics achievement, social political perspectives, stereotype threat, racial identity, and microaggressions.

Keywords: Mathematics; Racialized learning experiences; Black students; Undergraduate students.

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Introduction

Canada has been described as a land of freedom and as the 'Great Mosaic' in reference to its multicultural landscape (Corrêa & Oloo, 2022). Many Black loyalists and survivors of the Underground Railroad settled in Ontario - Canada's most culturally and racially diverse province (Walker, 2019; Harrell Jr., 2008). Today, Toronto, Ontario's largest city, is one of the most multicultural cities in the world (Qadeer, 2016). Yet, there are persistent gaps in educational attainment by race in Ontario and across Canada. For example, data show that Black students lag behind their peers in various indicators, including in mathematics learning outcomes. Further, Black and Brown students are overrepresented in special education behaviour classes and are more likely to be suspended from school (James & Turner, 2017). A report by the Toronto District School Board (2017), for example, noted that Black students account for 12% of its student population and close to one out of every two students (or 48%) who are suspended from school. Black students and their Hispanic and Mixed-race peers are also more likely to report the lowest levels of satisfaction with their school experience (Zheng, 2009).

Data on student achievement by race is not readily available in Ontario and across Canada (Whitley & Hollweck, 2020). However, where such information is available, it is clear that students' experiences are impacted by racial identity (Corrêa & Oloo, 2022). Indeed, Robson et al. (2018) found that students of Asian origins were more likely to transition to university from high schools in Ontario compared to Black and Latino students, who tended to have lower marks and were disproportionately placed in applied (non-academic) streams. James and Turner (2017) report that almost 40% of Black high school students in the Greater Toronto Area were enrolled in applied programs,

compared to 18% of other racialized peers and 16% of White students. While mathematical proficiency has far-reaching implications for success in life (Corrêa & Haslam, 2021), for too many students in Canada (including females and those from racialized and Indigenous backgrounds), academic success in mathematics is relatively rare.

In this review, we considered the racialized mathematical learning experiences of Black undergraduate students. As the National Research Council (1993) points out,

Mathematics is the key to opportunity. No longer just the language of science, mathematics now contributes in direct and fundamental ways to business, finance, health, and defense. For students, it opens doors to careers. For citizens, it enables informed decisions. For nations, it provides knowledge to compete in a technological community. To participate fully in the world of the future ... [we] must tap the power of mathematics (p. 15).

The statement by the National Research Council speaks to the power of education in attaining personal and societal good. However, as Harris (2019) reminds us, education can sometimes legitimize socioeconomic inequalities by favouring “those who already possess the kind of capital endorsed by the majority [W]hite, middle class” (p. 7). Therefore, the disadvantages that students of racialized minority backgrounds too often experience are sometimes reproduced and perpetuated despite the widely held view of Canada as a merit-based society (Yiridoe, 2021). Hence, the call by Museus and Neville (2012) for intentional attitudes and actions by universities to help “connect racial minority students to social capital (i.e., information and support) in the broader social networks at an institution and, in turn, facilitate their success” (p. 437).

Despite all the well-documented challenges, many Black students are completing high school and joining universities to study mathematics and other science, technology, engineering and mathematics (STEM) disciplines. The main goal of this study was to gather, analyze, and sort literature that addresses Black undergraduate students' racialized mathematics experiences. Research databases were examined using the keywords: math, racism, undergrad, Black students, and experiences. The time range investigated was from 2015 to 2022. Although significantly more research has been done on the experiences of Black students in the United States, our review draws on Canadian, United States, and international research. Five themes emerged from the examination of the literature on the mathematics learning experiences of Black undergraduate students: mathematics achievement, social political perspectives, stereotype threat, racial identity, and microaggressions. The following sections outline each of these themes.

Mathematics Achievement

Several community organizations and governments have proposed ways to address the unequal K-12 educational outcomes for Black students (James & Turner, 2017; Lewis, 1992). Some of the issues identified as disproportionately affecting Black students include fewer Black teachers, tolerance of anti-Black racist incidents in schools, harsher school discipline of Black students compared to their non-Black peers, and streaming of Black students into applied courses in K-12. In particular, in mathematics, research indicates that “scholastic aptitude, as well as certain levels of self-concept and certain socio-economic status variables, play a role in the prediction of

mathematics achievement” (Esterhuysen et al., 2001, p. 52). Different factors – cognitive, non-cognitive, socio-economic, home-related, school-related, teacher qualifications, and class sizes – can impact Black students’ achievement (Esterhuysen et al., 2001). Additionally, Esterhuysen et al. (2001) highlight the correlation between gender (identity) and students’ mathematics performance, while asserting that teacher-related factors tend to be some of the key predictors of Black male and female students’ mathematics performance. Further, since students’ culture can impact the relationship between students’ self-concept and their achievement in mathematics, care should be taken not to compare traditionally White and Black schools (Esterhuysen et al., 2001).

Another issue that can be raised is the relationship between students’ achievement, their learning skills, and teachers’ biases. Parekh et al.’s (2018) research results “strongly suggest the presence of implicit bias within teacher-reported assessments on how students approach their own learning” (p.19). Their research was based on 7,648 students in Ontario, Canada, followed from junior kindergarten to grade 12. It explored the relationship between students’ achievement, demographics, school variables, and the assessment of their learning skills as required by the provincial government. The study’s primary goal was to analyze “whether there is a disparity between students’ achievement and teachers’ perception of them as learners” (p.2). Research outcomes indicate that Black students were less likely to be assessed as having “excellent” learning skills when compared with other groups of students at similar achievement levels. The same was true for male students compared to female students, for students who needed special education support compared to students that did not need that support, and for students without postsecondary-educated parents compared to students with postsecondary-educated parents. Parekh et al. concluded that some groups of students are always perceived as not good enough, no matter how well they perform academically.

Delving into post-secondary opportunities, it is also possible to observe Black students’ experiences and how they relate to their mathematics achievement. Robson et al.’s (2018) study investigates grade 12 students’ post-secondary experiences based on a broad scope of variables (college or university acceptance, ethnoracial identity, sex, special education needs, immigrant generational status, high school grades, attitude toward education, academic or applied stream, financial status, and parental education). The authors examine whether there were changes between 2006 and 2011 in what concerns under-represented students’ enrolments in post-secondary education in Ontario, Canada. This data range coincides with several educational policies focused on inclusiveness and equity in Ontario. Research outcomes showed that, both in 2006 and 2011, Black students had lower academic achievement, more special education needs, and were more engaged in applied streams. Nonetheless, in 2011, when controlling for these variables, Black students were more likely to confirm university acceptance. According to the authors, this result may suggest that Black students “were getting better at navigating the ‘structural obstacle course’ that tends to stream them into lower-ability groupings and curtails their later-life academic choices” (p. 51).

Still, from a post-secondary viewpoint, Adiredja and Andrews-Larson (2017) suggest that the use of teaching approaches such as Inquiry-Based Learning and the Treisman Math Workshop has the potential to eliminate gender

and race inequities among Black post-secondary students and women. The former approach values engagement in mathematics inquiry, while the latter values the incorporation of collaboration in problem-solving. This perspective steers the focus of the discussion to teaching processes, moving away from a perspective that places the responsibility for learning outcomes on students. Indeed, given the literature emphasis on the impact of teaching practices (teacher training, teacher bias, school experiences, teaching approaches) on Black students' mathematics achievement, it is critical to acknowledge the need for improvement in teacher training programs and professional development opportunities that will allow teachers to better support Black students mathematics learning and achievement both at the secondary and post-secondary levels (see, for example, Esterhuysen et al., 2001; McGee & Bentley, 2017).

Socio-Political Perspectives

Because various socio-political factors can impact a student's mathematical learning experience, Adiredja and Andrews-Larson (2017) call for caution when reporting on the correlation between mathematics achievement and students' race and gender. They posit that an achievement gap analysis based on race and gender can perpetuate fictional narratives and that achievement expectations have dominant groups as references. Besides, the common-sense notion that it is normal for students to fail in mathematics results in placing the blame of unsucces "on individuals themselves, thus shifting the conversation away from social forces that impact the academic success in mathematics" (Gonzalez et al., 2020, p.457).

Adiredja and Andrews-Larson (2017) write, "[s]tudies that adopt a socio-political perspective focus on investigating 'accepted' norms and practices within the field of mathematics that privilege some people while excluding others" (p. 448). Their research points out that while STEM-related professionals are in demand in the USA and while these jobs represent economic stability, marginalized groups tend to be underrepresented among STEM professionals. Adiredja and Andrews-Larson argue that this lack of representation in STEM professions is due to the ineffectiveness of addressing the needs of marginalized students in post-secondary institutions. Hence, the need to address inequality of opportunities in STEM education. According to the authors, analyzing socio-political perspectives involves understanding the politics of knowledge, the complexities of identity and power, and how these three elements function in the context of students' mathematics learning experiences.

Issues relating to campus environment and Black students' needs at post-secondary institutions should also be considered. Strange and Cox (2016) remind us that developing a more inclusive and welcoming campus environment is essential for the success of all students, including those from diverse backgrounds. A UNESCO report (Altbach et al., 2009) builds on the issue of inclusivity and diversity and suggests that "making higher education more inclusive requires not only moving historically underrepresented groups into higher education but also meeting their unique needs" (p. xxiv). Such needs, according to Yusuf (2020), include the fact that "Black students who are enrolled in these [higher education] institutions experience challenges navigating them" (p. ii).

As a Black male himself, McPhatter (2015) describes some intrinsic situations that Black male students often experience and how these may affect their academic and personal lives. McPhatter addresses unwritten rules that Black male students “need to” navigate across predominantly White post-secondary institutions in the United States and how simple behaviours, such as a gathering among friends, can be unacceptable when coming from Black male students. The author’s discourse speaks to how Black male students need to build safe spaces for themselves and highlights that even today,

[B]lack males must remember not to live as if color does not exist and should remember that [W]hite society expects them to be appreciative for whatever concessions are granted to them even though their work must equal or surpass the work of their [W]hite male counterparts (p. 309).

In addition to unwritten rules, “ruling relations” is another crucial issue in the literature. Pawley (2019) points out that “[w]hat makes relations ‘ruling’ is that they primarily serve the interests of the institution over the people who participate in it” (p. 27). Pawley suggests that such relations can result in “academic institutions and disciplines ... valu[ing] certain forms of knowledge and knowing, certain ways of investigating the world” (p. 14) while rejecting other perspectives and worldviews. Writing that “ruling relations” often serve institutional interests and are meant to perpetuate power structures rather than prioritize students’ interests, Pawley identifies four ways in which “ruling relations” can be biased against students based on race and gender. These include 1) student financial aid programs that are not effective in serving some groups of students, including those who are needy yet are unfamiliar with the application process; 2) students’ life experiences and paths from two-year colleges, community colleges, or the military to four-year university programs that are not acknowledged and supported in students’ new educational choices; 3) students’ cultural differences and needs that are not valued; and 4) students’ different trauma and life needs, in particular, pregnant women and women with kids, that are not addressed. Pawley suggests that we “shift the burden of responsibility away from students and toward higher education as an institution” (p. 21).

Stereotype Threat

Black students are more disadvantaged in math-oriented fields due to competitive and hostile social environments at both secondary and post-secondary institutions (Corrêa & Oloo, 2022; James & Turner, 2017). Such an environment negatively affects Black students, not because they cannot compete against their peers, but because they are constantly challenged due to preconceived notions about their academic abilities, and to faculty and peers having lower expectations for them (Gelbgiser & Alon, 2016; Malone et al., 2023). Givens et al. (2016) identify three “pervasive stereotypes” about Black male students: “they are anti-intellectual and anti-school, they are prone to criminality, and they are hard, unemotional, and disconnected from the domestic sphere” (p. 168). The authors argue that:

Stereotypes are intimately tied to both the structures of racialization and the lived realities of students in school settings. Structurally, they are set within institutional frameworks that sustain oppression and inequality, where stereotypes provide an implicit rationale, ... [and] [a]t the interpersonal level, they are perpetuated through “microaggressions” (p. 168).

Such a stereotype-fuelled climate creates anxiety and pressure for Black students to perform in order to avoid what McGee and Martin (2011) refer to as “stereotype threat,” namely:

[A] type of confirmation bias in which the threat of being viewed through the lens of a negative stereotype or the fear of doing something that would inadvertently confirm that stereotype suppresses academic performance among Black students at all academic levels (p. 1348).

Stereotype threats seem to be a common phenomenon that impacts many Black post-secondary students. Roberts’ (2020) study analyzes the successful racialized mathematics experiences of students engaged in developmental mathematics at a two-year community college in the United States, which is the setting where “the majority of Black students begin their higher education journeys” (p.702). The study identifies four types of threats that students experience. These include hypervisibility, invisibility, explicit discriminatory behaviour, and questioning ability. Students’ responses to the stereotype threats involved working harder in their studies, focusing on academics, bolstering self-belief, calling out aggressors, defending peers, anger, asking more questions, becoming discouraged, and not seeking assistance.

Calling into question Black students’ academic abilities can impede Black students’ sense of self-worth and further exacerbate their marginalization by peers (Wilson-Forsberg et al., 2018). McGee and Martin (2011) draw attention to how Black students manage stereotype threats to succeed academically by sharing high-achieving Black students’ life experiences when studying mathematics or engineering in post-secondary institutions. The authors indicate that despite the obvious harmful impacts of real and perceived racism, anti-Black racist experiences motivated some Black students to adopt resilience strategies that were psychologically reaffirming and enhanced their academic achievement. That is, “[Black] students responded to the stereotypes by exercising agency and achieving success” (p. 1354). McGee and Martin present the term “stereotype management” to refer to the resilience strategies employed to cope with stereotype threats and avoid the association between academic performance and negative racial stereotypes. An example of a strategy employed by research participants to help counter the stereotypes was the motivation to stay on top of things and to excel in examinations, particularly exams at the beginning of the program.

McGee et al.’s (2016) research shows this same tendency. While many Black undergraduates had higher levels of intrinsic motivation than what had been ascribed to them by faculty and peers (with family being an external source of motivation), other students used the stereotype threat as extrinsic motivation to prove their peers, professors, and administration wrong. Similarly, Caxaj et al. (2018) found that, among Black students, having a solid sense of identity and an incentive to disrupt racist stereotypes was a motivating factor for academic success. However, as expected, McGee et al. (2016) report that using stereotype threats to fuel Black students’ academic achievements proved harmful to their mental health. Hence, more is needed to ensure that Black undergraduate students nurture their intrinsic motivation and are supported by their faculty to remain and complete their degrees in math-oriented fields (McGee et al., 2016).

Racial Identity

An individual's sense of identity can determine how the individual sees themselves within the world. Understanding who you are and what you can do impact how you interact in society. Gonzalez et al. (2020) write that, "an individual who doubts [their] ability to succeed will most likely be unsuccessful, in part because they neglect to engage in behaviours that might result in success" (p. 457). It is not different with students. Students' perceptions of who they are when it comes to mathematics are related to their mathematics performance (Gonzalez et al., 2020). These perceptions will shape one's identity through a long and complex learning process, often within existing power differentials enacted in racial biases and hierarchy. Racial biases begin to manifest in grade school, with students in secondary school reporting unfair treatment by guidance counsellors and teachers (Wilson-Forsberg et al., 2018). Racial hierarchy also begins in school from kindergarten through grade 12 and normalizes the academic disparities experienced by racialized groups (Miles et al., 2020). To enhance Black students' learning experiences and positively build on their racial identity, it is necessary to nurture students' connections to mathematics through culturally responsive teaching so that students are presented with opportunities to see themselves as part of the mathematics learning environment they are in (Gonzalez et al., 2020).

McGee et al. (2016) affirm that Black students are intellectually able; however, due to being negatively perceived, they can internalize various forms of oppression that could impact their academic experience and racial identity. Black students are often met with systemic inequality by, for example, being placed in applied classes or being persuaded from taking academic or advanced placement (AP) courses, which means they are socially and academically disadvantaged (Oloo & Corrêa, forthcoming; Gelbgiser & Alon, 2016). On the other hand, students who took AP courses in high school can recount negative experiences with their peers, staff, and faculty about race (McClain, 2014). In particular, in mathematics, being excluded from AP courses or having a detrimental experience in an AP course can be significantly harmful, given that mathematics is a gatekeeper in different scenarios. Examples from Ontario indicate that Black students are disproportionately placed in applied (non-academic) streams in high school, hence have lower chances of transitioning to STEM disciplines at the university (Corrêa & Oloo, 2022). These restraining circumstances negatively builds on students' racial identities.

From a post-secondary perspective, Gelbgiser and Alon (2016) detail that Black students may arrive at institutions with lower test scores and are less likely to come from high schools that offer advanced placements in mathematics and science relative to their White peers. The authors also found that Black students may lack the preparation and self-confidence to enroll and persist in engineering and other math-intensive fields. Consequently, Black undergraduate students experience lower academic achievements and often switch majors or continue their degrees without much support and in isolation (Gelbgiser & Alon, 2016). These experiences and decisions throughout Black students' academic lives are not only influenced by students' identities, but also further shape their identities.

Impacted by the racial identity and the socioeconomic diversity of predominantly White peers, Black students can struggle to make friends once they enter post-secondary institutions (McClain, 2014). In McClain's (2014) study,

Black students were unable to make friends during their undergraduate program in their faculty; one found a group of people to study with, another one had tried with her predominantly White peers but was rejected and never tried again. The enjoyment of attending post-secondary gradually decreased based on their feelings of belonging and isolation among their Asian and White peers. Many of the students in McClain's study were the only Black students in their classes, making them uncomfortable and hesitant to attend. The author explains that, due to not creating bonds with their peers, many students avoided asking questions in class so as not to look incompetent, and all of them carried themselves with similar demeanours and quietness. Participants noted moments of feeling racially isolated by faculty members and peers due to underrepresentation in their racial group. Besides, they were conscious of their dressing, demeanour, and how they speak when they meet with professors or participate in a class discussion so as not to be stereotyped. An argument raised is that learning requires interaction and collaboration as a cultural activity, but students from McClain's study did not experience this from their learning environment. Due to their racial identities, they often worked alone due to a lack of a collaborative and safe learning environment at their institutions.

Goings (2016), whose research investigated the experiences of high-achieving Black undergraduate students at Historically Black Colleges and Universities (HBCUs), points out that most research about high-achieving Black undergraduate students is focused on predominantly White institutions. In such institutions, it could be expected that Black students would disregard their racial identities to blend in, a behaviour that would not be expected in HBCUs. Interestingly, Black high achievers would argue that they "felt HBCUs did not embrace their individuality as their institutions had stringent rules in regard to their physical appearance and conduct" (p. 58). Goings used a scholar identity model, which "provides a multifaceted lens to view the academic and social experiences of high-achieving Black males" (p. 58). The study analyzed nine aspects: self-efficacy, willingness to make sacrifices, self-awareness, academic self-confidence, racial identity, internal locus of control, future orientation, need for achievement, and masculinity. The author highlights that the first five aspects, which include racial identity, were relevant to students' post-secondary education success.

On the specific experiences of Black female students in the United States, Chavous and Cogburn (2007) claim that "race matters in the academic experiences and adaptations of Black students" (p. 24). Chavous and Cogburn argue that Black female undergraduate students occupy dual and paradoxical spaces, being considered both at-risk and resilient. The authors suggest that Black female students are at risk because of the historical and present forces of socioeconomic oppression, and they are resilient due to their ability to attain success despite the barriers. While "resilience is essential for success in school and in life" (Yeager & Dweck, 2012, p. 302), a focus on resilience alone, without identifying and eliminating circumstances and social factors that make educational institutions unwelcoming to Black female undergraduate students may lead to "overgeneralizations and [inaccurate] popular images of Black women" (Chavous & Cogburn, 2007, p. 27). The overgeneralizations about Black female students affect how they see themselves, that is, how they model their identities. The image of a Black female student, as Frazier-Kouassi (2002) asserts, has sometimes been positioned in the public discourse and the academy as "successful, achieving, and independent" in contrast to the "endangered" Black male (p. 55). Chavous and Cogburn (2007) write that such "images

have become so prevalent within the popular and academic discourse around black achievement” that there is some “complacency among social science scholars and activists in recognizing the need to challenge and test the mechanisms underlying these images” (p. 27).

From a similar point of view, Fisher et al.’s (2019) study focuses on the publication rates of female students in STEM at the Ph.D. level. The study found that Black women experienced lower publication rates. Although there were no personal accounts of racial experiences, data suggested feelings of insignificance and discrimination that negatively affected students’ academic motivation. Research questions were centred around a sense of belonging, perceptions of the structure, well-being, publication success, and perceived level of preparation. The lack of feeling important, accepted, and capable in their departments had psychological effects; “[f]emale students were more likely to feel insignificant in STEM settings, less likely to feel accepted in STEM settings, and perceived that they were less prepared for advanced undergraduate classes and graduate classes in their area of study” (p. 8). As a result, female students’ perceptions of their identities, successes, and well-being were impaired.

Microaggressions

Racial microaggressions can be defined as “brief and commonplace daily verbal, behavioural and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults to the target person or group” (Sue et al., 2008, p. 273). According to Miles et al. (2020), microaggressions can be categorized into three types: environmental, behavioural, and verbal. Environmental microaggressions refer to a lack of representation or inclusion, which can be in relation to faculty members, student population, course material, or decorations. Behavioural microaggressions speak to conveying that certain people do not belong and treating people as lesser than others. Lastly, verbal microaggressions are slights or insults that can be overtly racist or unintentional affronts. An example is singling out a person of colour for their opinion in a class discussion. These microaggressions lead to decreased work productivity and school performance and increased anxiety, stress, and depression (Miles et al., 2020). Microaggressions perpetuate stereotypes (Givens et al., 2016).

Several studies have highlighted the presence and impact of negative stereotypes and microaggressions on Black university students. For example, Miles et al. (2020) affirm that Black students in STEM programs experienced repeated racial microaggressions that impacted their academic performance and mental health. The authors “attribute this to stereotypes and institutional climates that juxtapose [Black students’] STEM and racial identities as incongruent” (p. 1608). In Miles et al.’s (2020) research, different behavioural microaggressions – stemming from the stereotype that Black students are not as smart – were perceived through negative peer interactions. Participants from their study noted that they were aware this was unique to the Black experience. Many reported racial microaggressions relating to intellectual abilities and pre-conceived thoughts of Black people. The exposure to stereotypes and racial microaggression affects Black male students’ identities and sense of self (Givens et al., 2016). In the same way, Black female students “regularly encounter microaggressive forms of discrimination unique to

being Black and female;” these microaggressions tend to “communicate messages of inferiority, criminal status, abnormal cultural values, and rigid stereotypes” (Williams & Nichols, 2012, p. 75).

Morales (2021) notes that Black students feel “overburdened” in their response to incidences of racial microaggressions by “having to educate the offending party” (p. 72). Similarly, Burke (2020) refers to the ‘racial battle fatigue’ that results from the cumulative negative effect of racial microaggressions. In response, Black students often employ empowering strategies, including “culturally affirming counternarratives to actively oppose racial microaggressions” (Morales, 2021, p. 72). The counternarratives, which Morales describe as “a powerful form of resistant capital for Black students” (p. 73), take various forms and include “(a) asserting Black intellect; (b) centering Black history, culture and perspectives; and (c) affirming the diversity within Black communities” (p. 72).

Final Considerations

Due to systemic inequality, Black students are attracted to specific occupations such as engineering, which lead to higher rewards in the labour market over fields in humanities such as philosophy and literature that are historically preferred by the White elite (Goyette & Mullen, 2006). Statistically, Black students consistently exhibit a higher preference for math-oriented fields and occupations than White students. However, they are less likely to work in those occupations (Gelbgiser & Alon, 2016). Although during the commencement of their post-secondary experiences, Black students are more interested in STEM programs than their White peers, they are more likely to leave math-oriented fields and enroll in social science majors or drop out altogether (Goyette & Mullen, 2006).

In STEM higher education, White and Asian students are often portrayed as being at the top of the race-based hierarchy of academic ability (Miles et al., 2020). Writing about Black representation across schools and faculties of engineering in the United States, Miles et al. (2020) point out that 48% of engineering faculties have no Black faculty members and just 2.3% of engineering faculty members are Black. Indeed, Gelbgiser and Alon (2016) report that White and Asian male students and professors tend to be overrepresented in post-secondary math-oriented disciplines. The underrepresentation of Black students in math-oriented fields may stem from racial differences and systemic inequality (Gelbgiser & Alon, 2016). Consequently, Black students have fewer leaders and academic role models in STEM disciplines. A lack of Black professors and role models may foster an environment where it is harder for Black students to flourish (McGee et al., 2016). On the other hand, the presence of Black students and faculty on campus inspires Black undergraduates and enhances their self-confidence (McGee & Bentley, 2017). In many cases, the issues Black students’ must deal with fuel their desire to help their communities, become mentors, and pursue post-graduate studies, careers and interests in mathematics (McGee et al., 2016).

Black students experience greater exposure to stereotypes in traditionally male-dominated fields, such as engineering and computer science, than in more diverse areas, such as social sciences (Gelbgiser & Alon, 2016). Stereotype threats are a reality in Black students’ undergraduate mathematics learning experiences. Due to stereotype threats, there is increased psychological distress and decreased help-seeking behaviours (Miles et al.,

2020). This, together with discrimination and microaggressions that Black students face on campus, can be detrimental to their racial identity, academic success, and mental health. Therefore, it is crucial to acknowledge the importance of addressing race-based experiences in mathematics learning to better understand and portray Black students' experiences and the elements that may impact their successful advances in mathematics (Roberts, 2020).

To help counter some of these challenges, researchers and practitioners have put forward several recommendations. Gelbgiser and Alon (2016), for example, suggest that policy interventions aimed at promoting environments in mathematics-oriented fields that nurture the academic achievements of Black students will not only reduce the overall race gap in college, but could also improve the representation of Black students in STEM disciplines. In addition, Roberts (2020) identifies three practices that might help students: the intentional arrangement of working groups according to students' skills and capabilities, the creation of opportunities for students to share their expertise, and nurturing a classroom community grounded on caring and students' validating practices. Lastly, McGee and Bentley (2017) call for an increase in mentorship for Black students in undergraduate programs that provide them with research experience and foster relationships within their faculty. Similarly, Goings (2016) highlights the importance of having same-race peer support and interactions with Black faculty members, highlighting the challenges Black undergraduate students might face due to a lack of such interactions.

In conclusion, we want to emphasize that a common thread in the reviewed studies, whether conducted in Canada, the United States, or elsewhere, was that while transition from secondary to post-secondary education presents challenges to almost all students, Black undergraduate students, including those in mathematics-related fields, tend to experience barriers that are unique to their being Black. These include negative racial stereotypes, racial microaggressions, being held to low expectations by their instructors, as well as underrepresentation of Black students and faculty. Many of these challenges are structural and have been historically perpetuated to maintain power structures in the society. By highlighting them and calling on stakeholders (including post-secondary institutions) to recommit to promoting equity, diversity and inclusion while tackling anti-Black racism on campus, we believe that through this study, we have, in a small way, contributed to watering the seeds that have been planted by others to enhance mathematic-learning experiences of Black undergraduate students.

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