Barriers to Inclusion Experienced by Biological Science Graduate Students at a Mid-Sized Canadian University: A Mixed-Methods Research Study

Virginia Capmourteres[1], Molly Contini[2], Ala Alzubi[3] & Jennifer M. Monk[3]

[1]College of Biological Science, University of Guelph, Guelph ON, Canada, N1G 2W1

[2]Department of Psychology, University of Guelph, Guelph ON, Canada, N1G 2W1

[3]Department of Human Health Sciences, University of Guelph, Guelph ON, Canada, N1G 2W1

Correspondence: Jennifer M. Monk, Department of Human Health Sciences, University of Guelph, Guelph, ON, Canada, N1G 2W1. E-mail: jmonk02@uoguelph.ca

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Abstract

Graduate student development has the potential to flourish when participation in the academic experience is accompanied by respect and inclusion. We utilized a mixed methods approach (online survey and focus groups) to identify inclusion barriers experienced by biological science graduate students that prevent them from full engagement in their graduate experience and negatively influence their development. Forty-six percent of graduate students surveyed identified discrimination as a barrier, but only 5% reported these experiences to university authorities/administration. Identified inclusion barriers were related to: i) financial literacy and equity, ii) recruitment and admissions, iii) student well-being, and iv) accessibility. Proposed solutions to address these barriers include financial aid awareness, mental health and cultural sensitivity training, increased mentorship opportunities, and improved communications with students. Mobilizing student affairs professionals to move research into practice, establishing institutional polices that outline clear expectations for graduate programs and implementing defined processes for reporting barriers to inclusion could also help improve graduate student development and experience.

Keywords: graduate school, barriers to inclusion, student experience, student development, phenomenology, Canadian student affairs

1. Introduction

Graduate studies offer opportunities for advanced discipline-specific knowledge and critical skill development (Perez et al., 2020), as students learn to critically evaluate and produce new knowledge in their field, using evidence-based methods. In the biological sciences, graduate students in research-intensive, thesis-based programs, are expected to demonstrate competency in both cognitive skills (e.g., applying technical knowledge, identifying problems and solutions, making creative and complex judgements, critical thinking) and behavioral skills (e.g., adaptability, organization, communication and building interpersonal relationships) (Parker, 2012; Rayner & Papakonstantinou, 2015; Yao & Tuliao, 2019). This holistic training is key as many graduates (e.g., 40% of doctoral graduates) transition into government, industry, and the not-for-profit sectors after graduation (Kozma et al., 2021).

Although graduate studies promote the development of knowledge and skills, they can also present unique challenges for graduate students. From a demographic standpoint, graduate students are older than their undergraduate counterparts, and they may also have children and/or additional financial responsibilities, and therefore, focus more on their work-life balance (Blalock et al., 2023). Graduate students can also face distinct mental health challenges, as they have been shown to experience higher rates of anxiety and depression compared to the general population (Evans et al., 2018). This may be driven, in part, by financial concerns, limited sense of belonging, challenging relationships with advisors, and the workload of graduate studies (i.e., conducting research, publishing research findings, coursework and teaching/teaching assistant responsibilities) (Divaris et al., 2012; Gallea et al., 2021; Laframboise et al., 2023; SenthilKumar et al., 2023). Furthermore, mental health challenges may have been exacerbated during the COVID-19 pandemic due to uncertainty about the future and career impacts, financial insecurity, and the need to maintain research activity with little support from advisors (Clarke, 2023;

Shillington et al., 2024; Shoaib et al., 2023; Tienoven et al., 2022).

Students with diverse backgrounds and experiences may experience further challenges in graduate school. Diversity amongst students in graduate programs has increased, including cultural and ethnic diversity (Schenarts, 2020), a higher proportion of female students, students with diverse sexual orientations (Kincl, 2020), first-generation university students, and students from a range of socioeconomic backgrounds (Clarke, 2023; Johnson & Sveen, 2020). Although policies of internationalization and multiculturalism have favored the increased diversity of the student population (Buckner et al., 2021; de Wit & Altbach, 2021), the curriculum and financial support of student services provided at most institutions have not adapted to serve the needs of diverse students (Doucette et al., 2021). Experiences of discrimination and accessibility challenges may result in students leaving graduate studies, which has been shown to disproportionately affect females and individuals from underrepresented groups (Chu et al., 2022; SenthilKumar et al., 2023; Wallace & York, 2020). At the graduate level, institutional supports may be limited (in contrast to supports directed at the larger undergraduate student population), and there is a generalized lack of training and awareness of graduate student specific needs (Dykema et al., 2022). As graduate enrollment continues to increase in number and diversity, identifying and implementing solutions for the barriers that graduate students face is necessary to offer effective and inclusive experiences that enhance student development. In this study, we explored graduate students and their university experience through the lens of Student Development Theory (SDT) (Chickering & Reisser, 1993; Jones & Abes, 2013), which postulates that students undergo complex growth during their university years. This complex growth (or development) is multidimensional and can be represented through any combination of seven vectors that reflect the way students develop: i) integrity (balancing their values with those of others), ii) purpose (pursuing a vocation), iii) mature interpersonal relationships (learning to maintain healthy relationships), iv) competence (increasing intellectual, manual, and interpersonal abilities), v) capacity to manage emotions (recognizing and controlling feelings), vi) achieve independence (building self-directedness), and vii) an establish identity (accepting oneself and one's lifestyle) (Chickering & Reisser, 1993; Jones & Abes, 2013).

Unlike narrower psychological or behavioral theories that focus on isolated aspects of experience (e.g., motivation, stress), or more recent metatheories that incorporate broad constructs that may be hard to measure (e.g., transformative learning, learning ecologies), SDT offers a holistic lens that permits exploration of academic, social, emotional, and identity-related dimensions of the graduate student experience. Historically, graduate student success within their programs has been viewed narrowly (e.g., students' academic abilities, aptitudes (Golde, 2000; Lovitts, 2001); and has not taken into account other aspects of students' emotional, social and cognitive experiences, degree of social integration and development of peer relationships that can also play a critical role in their success within the program (Gansemer-Topf et al., 2006; Lovitts, 2001; Tinto, 1993). In accordance with SDT, this work recognizes that graduate studies can represent a critical stage in a students' development (Gansemer-Topf et al., 2006) and experiencing barriers (i.e., physical, psychological, institutional, cultural, or social factors) that prevent inclusion and/or engagement in any aspect of graduate studies may hinder graduate students development in one or a number of the seven SDT dimensions.

This study contributes to theory and practice on student development at the graduate level. Our specific objectives were to: i) identify and discuss the barriers preventing graduate students from fully engaging in their graduate experience, and ii) propose potential solutions that could be implemented in both the short- and long-term at the institutional level to improve graduate training.

2. Method

2.1 Research Design

This study was conducted within the College of Biological Science (hereafter, the College) at a mid-sized (i.e., 10,000-30,000 students) Canadian University. This study utilized a mixed methods approach that combined an online survey and focus group phenomenology. The online survey comprised the quantitative component, allowing for the collection of data pertaining to students' experiences with discrimination and bias, which can be a specific type of barrier to engagement in graduate studies. In contrast, the focus group phenomenology represented the qualitative component of this study and was intended to identify additional types of engagement barriers, uncover the meaning behind students' experiences with the barriers they encountered, and capture the emotional, social, and contextual nuances of their experiences. By combining these two methods, the study benefits from both breadth and depth: the survey provides an overarching view of discrimination and bias-based barriers that students encountered, while the focus group phenomenology offered specific insights into graduate students' experiences facing any barrier to engagement in graduate studies. All participants provided their written informed consent, and the study was approved by the Institutional Research Ethics Board (#20-09-024).

2.2 Graduate Student Demographics Within the College

At the time this study was conducted (March 2021) graduate student enrollment within the College was 414 students. 68% of students identified as female, 27% as male, and 5% as non-binary. The predominant ethnic group was Caucasian (72%), followed by East Asian (9%), South Asian (8%), Black (3%), and Latin American (2%). 6% of students preferred not to answer the item pertaining to ethnicity. Most graduate students were between 21-25 (56%) or 26-30 (30%) years of age. 14% of students did not provide age data. With respect to sexual orientation, 74% identified as heterosexual, 15% as bisexual, and 7% as homosexual and 4% preferred not to provide data. Although the majority of students (64%) did not identify as having a disability, 23% of graduate students identified with having a mental health disorder.

2.3 Online Survey and Quantitative Analysis

We administered an anonymous online survey to graduate students within the College by email, using the Qualtrics Insight Platform. Participation was optional and skipping questions was permitted. The survey focused on determining i) students' experiences of discrimination and/or bias during their graduate program, and the subsequent effect of these experiences (if any) as a barrier to graduate student inclusion, engagement, academic performance/productivity and/or well-being, and ii) if students were aware of institutional efforts and availability of resources to support those experiencing discrimination and/or bias (Table 1). The survey included open-ended (short-answer) researcher-generated questions, which were analyzed using descriptive statistics (e.g., frequencies, percentages) and the answers were categorized based on their similarity and counted. Participation incentives were offered through a random draw ($50 Amazon gift cards, selection odds 1 in 100). Respondents were provided with a separate link to sign up for the participation incentive gift card draw to guarantee anonymity.

Table 1. Online Survey Questions

Survey Question
Please identify your role/position within the College?
Do you feel that you have experienced discrimination in the College?
Can you identify these types of discrimination (e.g., racial discrimination, gender discrimination, religious discrimination, etc.)?
Have you personally experienced explicit biases or discrimination (e.g., racist comments) in your graduate program? If yes, can you describe your experience(s)?
During your time in your graduate program have you personally experienced subtle or implicit biases or discrimination (e.g., stereotyping, generalizations)?
If yes, can you describe your experience(s)?
Did this experience have a negative effect on your happiness, confidence, and/or well-being to some extent?
Did this experience have a negative effect on your work productivity?
Did this experience have a negative effect on how you engaged with your work in the graduate program?
Did you ever report your experiences with discrimination or bias to anyone within the College? If yes, to whom (e.g., supervisor, faculty, administration, etc.)?
Do you think there are adequate resources (e.g., support systems, assistance with formal complaints, etc.) within the College for an individual to turn to when concerns of discrimination arise?
Do you think the College is committed to making an effort to cultivate inclusion among their staff/faculty/students?

2.4 Focus Groups and Qualitative Analysis

For the qualitative component of this study, we used a thematic qualitative analysis informed by phenomenology. The phenomenon under study was the graduate student experience, in particular, the barriers that may prevent students from fully engaging in graduate school, that described a "common meaning for several individuals of their lived experience" (Creswell & Poth, 2018). We used a purposeful sampling approach to recruit participants who could provide diverse and complementary perspectives on the barriers experienced by graduate students; hence, we sent an open invitation to participate in the focus groups by email to all graduate students (n=414), faculty (n=102), and student affairs professionals (hereafter, SAP; e.g., graduate program administrators, teaching staff, laboratory

coordinators; n=25) within the College. SAP and faculty were included to provide a breadth of perspectives informed by graduate student interactions who are privy to administrative and policy-perspectives relevant for identifying barriers in graduate studies. Focus groups were conducted because they may elicit more experiential reflection than individual interviews, as participants articulate their own views in response to others' opinions. Eight separate focus groups were held for students, faculty, and SAP to avoid potential power dynamics influencing the discussion: three groups for students (n=7 participants), three for faculty (n=8 participants), and two for SAP (n=7 participants). A sample size of 22 participants is within the recommended range for phenomenological studies (Creswell & Poth, 2018) and includes sufficient voices while avoiding cacophony (Bartholomew et al., 2021). Small sized focus groups also allowed us to adapt to the pandemic context [refer to (Carter et al., 2021) for a discussion on adjusting group size based on context and participant needs] and to prioritize confidentiality [refer to (Sim & Waterfield, 2019) for a discussion on the importance of maintaining confidentiality]. Focus groups were asked: i) What are the barriers to inclusion experienced at the graduate level in the College? and ii) What are some steps that the College can take to improve inclusion and experience at the graduate level? Focus groups were held virtually on Zoom transcribed using Otter.ai. A member of the research team took notes to capture elements of the non-verbal language that can be lost in transcriptions.

Our data analysis approach was transcendental: we focused on the experience of participants as told by themselves, instead of our own interpretations (Creswell & Poth, 2018). We reviewed the focus group transcription giving, a priori, an equal value to all statements (Creswell & Poth, 2018; Eddles-Hirsch, 2015). While we used SDT as a theoretical framework to identify concepts and relationships to explore, we used an inductive approach for data analysis. Inductive thematic analysis is a bottom-up approach, where themes are derived from the data instead of being pre-defined. Accordingly, we first identified codes and collated data related to each code. Next, codes were grouped into potential themes (Braun & Clarke, 2006). As such, the themes were driven by the data and not the theoretical framework (Braun & Clarke, 2006). Although the primary goal of this phenomenological study is to describe the lived experiences of participants, we still report frequency to demonstrate that the themes identified here are not isolated cases but indeed reflect common patterns across participants. The facilitation of the focus groups and thematic analysis were conducted by one individual for consistency purposes; however, the codes and themes were discussed among team members to ensure the best possible representation of the participants' experience.

3. Results

3.1 Online Survey: Barriers to Graduate Education

The online survey was completed by 56 graduate students (27 doctoral and 29 master students; 13.5% response rate). Experiencing discrimination and/or bias was identified as a barrier to engagement in graduate studies by 46% of students (n=26 survey respondents or 6.3% of graduate students in the College). Incidents of racial and gender discrimination were most commonly reported (13 accounts each), but religious discrimination (2 accounts), opportunity gatekeeping, mental health stigma, and financial discrimination (1 account of each) were also reported (note: some students reported more than one instance of discrimination). When asked about personal experiences with discrimination and explicit bias, 14.3% of respondents (n=8) indicated they experienced condescending remarks about females (4 accounts), racially charged comments (2 accounts), and being treated differently (2 accounts). When asked about personal experiences with discrimination and implicit bias, 28.6% of respondents (n=16; although not all students provided specific examples), mentioned undervalued female graduate student work (4 accounts), racially charged assumptions and biases (4 accounts), generalizations and stereotypes (3 accounts), uncomfortable or unprofessional interactions with faculty (2 accounts), and gender identity microaggressions (1 account). Although experiences of discrimination and bias were reported to have negatively affected graduate students' work productivity (16%; n=9), engagement in their graduate studies (30.4%; n=17) and overall well-being (28.6%; n=16), only 5.4% (n=3) students reported these negative experiences in the College.

Most respondents (55.4%; n=31) perceived that the College was trying to cultivate a culture of inclusion, but they did not know if supportive resources for students experiencing discrimination were adequate. To address this deficiency, 71.4% (n=40) of respondents identified the need for ongoing mandatory Equity Diversity Inclusion (EDI) training for students, faculty and SAP in addition to recommending: i) the development of a transparent process for reporting experiences of discrimination or bias (8 accounts); ii) availability of an impartial SAP contact for safe and/or anonymous reporting of discrimination experiences (6 accounts); iii) improved communications to increase awareness of available resources for graduate students (2 accounts); and iv) opportunities to connect graduate students with mentors apart from their research advisor (2 accounts). Thus, an evaluation of institutional approaches for EDI training and reporting of instances of graduate students experiencing discrimination and/or bias is broadly

recommended.

3.2 Focus Groups' Perspectives on the Barriers to Inclusion Experienced at the Graduate Level

The thematic analysis of graduate students, SAP, and faculty focus group discussions revealed four major themes related to barriers to graduate student inclusion: i) financial literacy and equity; ii) recruitment and admissions; iii) student well-being; and iv) accessibility and access. Frequencies are provided in brackets to illustrate how common the themes were.

3.2.1 Financial Literacy and Equity (16 Focus Group Mentions: 5 within Faculty Groups, 7 within Graduate Student Groups, and 4 within SAP Groups)

Both financial literacy and financial equity were identified significant barriers to inclusion. Financial literacy is the ability to understand and make informed personal financial decisions (Lusardi & Mitchell, 2011). Broadly, financial equity is characterized by equal or just access to financial resources and opportunities. In a graduate studies context, financial equity pertains to debt load, unequal stipend amounts, tuition and fees, cost of living expenses, and access to federal and/or provincial scholarships. Both financial literacy and equity represent a barrier identified by all focus groups, albeit from different perspectives, and represent a barrier that resonates across institutions (Laframboise et al., 2023). From a graduate student perspective, the lack of financial literacy manifests before applying to graduate school because prospective students may not know where to find information on costs, scholarships, and financial aid. Graduate students also mentioned a considerable disparity between funding opportunities for domestic and international students as an example of financial inequity; in particular, international students pay double the tuition fees but are ineligible for most scholarships, which faculty identified as a financial barrier to inclusion in graduate studies. These findings are in line with existing literature, which suggests financial stress often disproportionately affects graduate students from equity-deserving groups, those living with a disability and international students (Laframboise et al., 2023). Another example of financial inequity discussed by graduate students was that, at the undergraduate level, many students work outside of academia during the summer to pay for their undergraduate studies. Therefore, these students do not gain discipline-specific experience in research and/or volunteer experiences that may reduce their competitiveness for graduate scholarships.

Faculty expressed feeling a sense of personal responsibility for helping students meet their financial needs. For example, one faculty participant created an emergency fund in their lab to support students who are struggling financially, but this is not the norm. Another faculty participant reported working with prospective students before they apply for admission to ensure the student has sufficient research experience to secure scholarship funding. Faculty acknowledged that graduate student stipends do not increase in proportion with inflation, and some feel obligated to increase student stipends above the minimum funding, which can create inequities in stipends between graduate students in different research groups. It was also brought up that most scholarships provide funding for only one year and require students to re-apply, where the success of their application is not guaranteed. SAP highlighted that students' backgrounds and familiarity with graduate studies can also influence their financial literacy, as they may have different degrees of knowledge on graduate funding.

3.2.2 Recruitment and Admissions (17 Focus Group Mentions: 11 within Faculty Groups, 3 within Graduate Student Groups, and 3 within SAP Groups)

Both graduate students and faculty identified that incoming students are often unaware of the graduate school application process, and that (at this institution), thesis-based students must first contact and secure a faculty advisor. Students may think that this requires forging relationships with faculty during their undergraduate studies or obtaining laboratory experience prior to applying. Consequently, some students may feel turned away from graduate studies, unaware that prior experience is not necessary and faculty are waiting for potential students to make contact. Faculty identified recruitment as a challenge, particularly for first-generation university students with limited knowledge about the process who may require more application guidance. According to SAP, students may start their programs with unrealistic expectations or beliefs about their role and success in graduate school.

Rolling admissions (i.e., a system where there are no application deadlines and students can apply any time of the year for admissions) was also identified by faculty as a barrier to inclusion. The concern is that faculty advisors do not get a pool of applicants to fairly evaluate and choose from at one time, which is further exacerbated by the lack of clear program admission and evaluation criteria beyond undergraduate grades. Consequently, applications may not be evaluated similarly, and faculty members' personal biases can influence who is offered admission. If faculty have a position open in their lab, they must recruit ad hoc for that position and decide among the few students who have expressed interest at that time, leaving other qualified candidates yet to apply without an opportunity because there

was no set application deadline. Faculty have limited funds available to pay graduate student stipends, and therefore, preferentially select applicants more likely to secure external funding (e.g., those with high grades, academic achievements, prior research or publication experience). Faculty and SAP admitted that this limits opportunities for applicants from equity-deserving groups who have relevant experiences outside of these traditional metrics. Challenges associated with the recruitment and admissions process for graduate studies will be both context and institution specific, however, the general theme of graduate students experiencing barriers in this process could be applicable across institutions.

3.2.3 Student Well-Being (29 Focus Group Mentions: 7 within Faculty Groups, 12 within Graduate Student Groups, and 10 within SAP Groups)

The focus groups discussed the theme of graduate student well-being, which included mental health, the influence of student-advisor relationships, and sense of belonging, which are themes that resonate across institutions at the graduate level. Regarding mental health, several graduate students expressed feeling "mentally drained" or in a "burnout state", as well as receiving minimal guidance on how to access support resources. Students' experiences with mental health seemed to depend heavily on the support provided by their advisors and/or lab peers. Students identified their faculty advisor as a critical support resource; yet, not all advisors are willing to engage in conversations about graduate student mental health. Faculty acknowledged feeling ill-equipped to provide mental health support to graduate students and indicated that the institution should provide supports that target the specific needs of graduate students. Students identified additional challenges including economic constraints and the cost of accessing professional mental health supports, and the influence of the COVID-19 pandemic. In the words of a student: "During COVID I saw this, the worst scene ever […] students do not get to come to the lab every day […] they are concerned about graduation, […] about the quality of the work, […] about the requirements […] it does not sit well with their mental health."

Regarding student-advisor relationships, graduate students stated that advisors have different expectations and demeanors toward students, wherein some are "very laissez faire" and others are "controlling, you clock in, clock out sort of attitude towards grad students." This might determine whether students develop a strictly professional or more personal connections with advisors where mentorship extends into non-professional aspects of students' lives. One faculty claimed that advisors are the "prime driver of graduate student happiness" and have a "direct responsibility for building a supportive and happy culture in their labs." SAP agreed with the importance of the lab environment but also highlighted that there is an inherent power imbalance in student-advisor relationships that may disadvantage students if a conflict arises.

Sense of belonging was the third aspect of student well-being brought up by focus groups. Graduate students explained that some situations can jeopardize sense of belonging. Examples included a lack of representation of equity-deserving groups amongst SAP and faculty, limited professional development events or opportunities (e.g., field trips, student and/or faculty social events, networking opportunities) that facilitate graduate students building networks with faculty and other students, and the missed in-person interactions in the aftermath of the COVID-19 pandemic that facilitate building community between graduate students. Consequently, there have been fewer opportunities for peer-to-peer learning and socialization required to build sense of belonging. SAP added that sometimes students struggle to conform to expected behaviors that have become a norm within their discipline (e.g., sport scientists are expected to participate in athletic events outside of the lab) or can feel unwelcome if they show different interests than the rest of the group.

3.2.4 Accessibility and Access (12 Focus Group Mentions: 4 within Faculty Groups, 4 within Graduate Student Groups, and 4 within SAP Groups)

Accessibility barriers to inclusion in graduate school included physical constraints and access to either resources and/or opportunities. Students identified physical accessibility challenges such as the lack of automatic doors and adjustable benches in labs and limited space in labs to move around. Students and faculty explained that some of the building doors do not have operating accessibility buttons in the evenings and weekends, despite some research activities requiring lab access during these times. The experience of physical barriers to inclusion may be context specific.

With respect to access to resources, faculty highlighted the unequal access to relevant courses in the graduate curriculum, explaining that there is a limited offering of graduate courses and that these may not align with students' research projects. Relatedly, SAP also identified that students might be exposed to different training opportunities, but that these might not align well with students' personal circumstances (e.g., students have the chance to travel for fieldwork but must incur additional expenses to travel).

3.3 Focus Group Perspectives on Steps to Improve Inclusion and Student Experience at the Graduate Level

Focus groups were asked, "What are some steps that the College can take to improve inclusion and experience at the graduate level?" and four major themes regarding recommendations that could be implemented to decrease barriers were identified. Frequencies are provided in brackets to illustrate how common the identified themes were within focus groups.

3.3.1 Enhancing Financial Aid and Support (5 Focus Group Mentions: 3 within Faculty Groups, 1 within Graduate Student Groups, and 1 within SAP Groups)

Faculty members had two recommendations related to financial equity: to increase minimum stipends with the financial support from the College (so the onus is not only on advisors) and to rethink the use of internal College funds to provide more scholarships, especially for graduate students from underrepresented groups. SAP made the suggestion to foster better relationships with alumni and seek additional financial support through donations and fundraising. Students also mentioned the need for increasing funding, including scholarships. The applicability of this recommendation may be dependent on the institution, as graduate stipends vary between institutions, however, the breadth of financial challenges and financial insecurity experienced by graduate students (albeit within a Canadian context) has been thoroughly reported (Laframboise et al., 2023), and therefore, has a broad applicability.

3.3.2 Promoting EDI and Mental Health Training (11 Focus Group Mentions: 4 within Faculty Groups, 3 within Graduate Student Groups, and 4 within SAP Groups)

All focus groups identified the need for increased training with respect to EDI, mental health, and cultural sensitivity (i.e., awareness and respect of cultural differences and practices of individuals from diverse backgrounds) in the workplace. Faculty advocated for mandatory training across the College with additional supports on how to put EDI principles into practice, whereas graduate students were wary of mandatory training, instead suggesting that the trainings be attended only by those from the College community that are genuinely interested. Conversely, SAP suggested customizing the training initiatives for small, targeted audiences so that the content and learning outcomes are appropriate and applicable for the attendees. EDI training and mental health support availability for graduate students will vary between institutions, however, there is broad applicability in prioritizing these support resources for graduate students.

3.3.3 Providing Opportunities for Mentorship and Networking (9 Focus Group Mentions: 4 within Faculty Groups, 4 within Graduate Student Groups, and 1 within SAP Groups)

Faculty expressed the need for more student mentorship outside the graduate student-advisor relationship as this practice could both help students achieve greater academic mastery while also facilitating access to diverse perspectives. This approach could support students from equity-seeking groups connect with role models who may share their experiences and provide personalized advice. Conversely, SAP suggested the exploration of co-advising arrangements in graduate studies, again to introduce students to diverse perspectives beyond their primary advisor. Graduate students expressed interest in having additional mentors, but suggested these mentors could include faculty, senior students, or representatives from professional organizations. Students also discussed the importance of promoting student-to-student mentoring among international students, a sub-set of the graduate student population that may experience more challenges adapting to graduate school due to cultural and linguistic barriers. Therefore, there is broad applicability across institutions in this recommendation.

3.3.4 Improving Communications (9 Focus Group Mentions: 4 within Faculty Groups, 3 within Graduate Student Groups, and 2 within SAP Groups)

Faculty highlighted the need for the College to engage with graduate students more often to seek their input on the inclusion barriers experienced. Suggested examples included holding townhalls where students can ask questions or anonymous feedback options (e.g., mailboxes or online forums where graduate students can express concerns). Graduate students advocated for ways to make communications more transparent, such as having an intermediary SAP to address concerns and offer advice, maintain confidentiality, remain unbiased in case of conflicts between students and faculty, and be knowledgeable about student services on campus. Students also advocated for streamlined communications on a single electronic platform. SAP discussed the need for a consistent communication strategy despite changes in administrative leadership. The applicability of this recommendation will be institution specific based on the communication strategies currently employed for graduate students, however, a re-evaluation of how institutions communicate with graduate students and seeking feedback from the graduate student population is a broadly transferable recommendation across academic institutions.

4. Discussion

4.1 Addressing Barriers to Inclusion in Graduate School

In this study, we analyzed the barriers experienced at the graduate level at a mid-sized Canadian university, which could be extrapolated to reflect the graduate training experience more broadly. These barriers included experiences of discrimination and bias, lack of and/or unawareness of both institutional efforts to address barriers and the support resources (as per our survey data) that are available for graduate students, in addition to challenges associated with financial literacy and equity, recruitment and admissions into the graduate program, student well-being, and accessibility and access to mentorship and professional networking opportunities (as per our focus group data) (Figure 1).

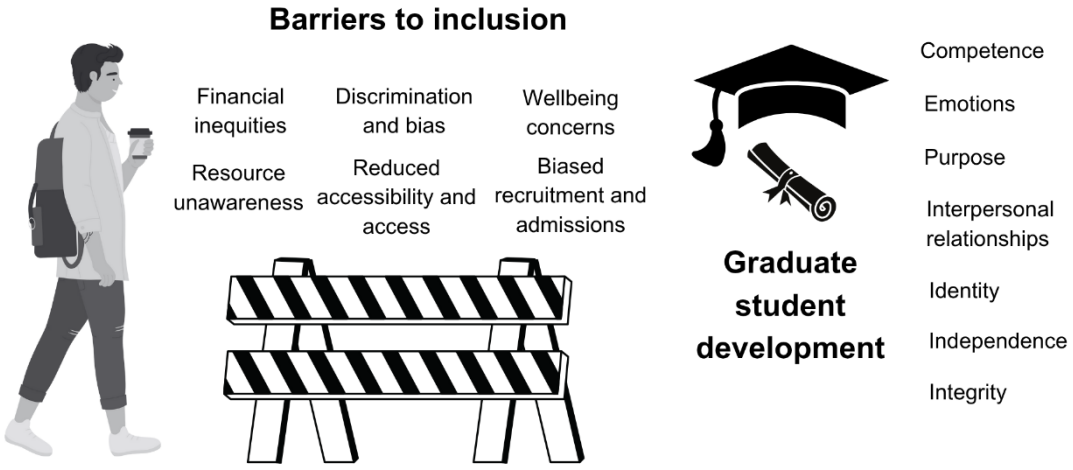

Figure 1. Barriers to Inclusion in Graduate School May Hinder Student Development and Prevent Graduate Students from Fully Engaging in their Graduate Experience

Based on the perspectives shared by graduate students, faculty and SAP we propose the following recommendations to be implemented at the institutional level to help reduce current inequalities in the higher education system, but also to promote the holistic development of graduate students:

(1) Improve awareness about financial support for graduate students. Education on this topic should be provided to all current and prospective students before they apply to graduate school. This should include, at least, a full understanding of guaranteed financial aid, an accurate perspective on the availability and success rate of scholarships, and updated data on the cost of living in the area. This is critical for students to budget in advance, compare funding packages across institutions, discuss the issue with prospective advisors, and make an informed decision on graduate school affordability. This will be especially important for international students who face additional tuition and moving and settling costs, and students from underrepresented groups who are significantly disadvantaged in the awarding of scholarships (Baskaran et al., 2021; Laframboise et al., 2023).

(2) Enhance training in equity, diversity, inclusion, and mental health. This would include, at a minimum, mandatory training that is offered to students, faculty and SAP alike, that should be customized in a way that it resonates with the role of the intended audience (e.g., teaching, supervising, student servicing, recruiting, peer to peer mentoring). Inclusion of students' diverse perspectives in the design and development of an EDI training course can promote a sense of belonging and has been shown to promote students' feelings of agency, which increased their individual investment in the course (Robertson et al., 2023). More advanced training is also recommended for those with a keen interest to lead initiatives in these areas. While training alone may not change the behaviors of the majority, diverse and inclusive environments promote awareness and learning interest (Harrison-Bernard et al., 2020), and therefore, can contribute to a culture of inclusivity. The development of this kind of training would also require the measurement of system-level outcomes (e.g., academic achievement disparities, sense of belonging, campus climate) to ensure its effectiveness (Devine & Ash, 2022).

(3) Offer various mentorship and networking opportunities. Graduate students would benefit from establishing more fruitful relationships with diverse mentors and peer groups, as socialization and sense of belonging beget student success (Dykema et al., 2022). Diverse mentorship provides students with a broader range of perspectives, which in turn improves their cultural awareness and skill development (Pfund et al., 2022). Additional mentorship opportunities could include exploring co-advising models, being invited to attend another advisor's lab meetings within graduate students' fields of research and increasing the degree of involvement of thesis advisory committee members. Institutions should also promote and support student-led groups and initiatives, which can encourage academic, social, psychological, and career development among graduate students (Lorenzetti et al., 2019). To supplement these additional mentorship and networking opportunities, the implementation of best practices in graduate student supervision such as developing a shared supervisory contract (Schmidt & Hansson, 2018), providing guidance while also encouraging independence (Aldosari & Ibrahim, 2019), and setting clear goals and expectations (Tugendrajch et al., 2021) are recommended.

(4) Revisit and improve the communication strategy about student services. Graduate students need to be able to identify and understand the resources and services available to them that can help them with various aspects of their development and well-being. An improved communications strategy should include a description of the different student affairs professionals within the College and their specific roles, a full picture of the student affairs units on campus and the services provided by each unit, and access to easily identifiable resources (e.g., website, student handbook) where critical information resides and is updated regularly. For instance, a survey of both undergraduate and graduate students from science programs determined that low awareness of what resources are available to them was a significant barrier to accessing support services (Ménard et al., 2024). Importantly, most students found these services helpful once accessed, which highlights the impact of overcoming the critical barrier of awareness and access to support resources (Ménard et al., 2024). Similarly, email communications should be streamlined as much as possible (e.g., in the format of newsletters or weekly summary announcements). Soliciting input from graduate students about communication strategies that are more accessible or relatable may help improve communication. Given the link between awareness and use of services (Perry et al., 2020), an improved communication strategy could support graduate student development.

(5) Establish clear expectations for navigating graduate school. The "hidden curriculum" in graduate studies can be defined as the informal or often unrecognized institutional practices, norms, and behaviors that are rarely explained, thereby leaving students to discern their existence and relative importance either independently or with the help of mentors/supervisors (Enders et al., 2021). Consequently, navigating the "hidden curriculum" in graduate studies can influence how graduate students access opportunities and experience inclusion (Enders et al., 2021). In order to make the 'hidden curriculum' explicit for all graduate students alike, institutions should require written agreements between supervisors and students to outline the responsibilities and expectations of each party during the students' graduate studies. Other aspects of the 'hidden curriculum' that should be brought to light include policies, procedures, and timelines that affect graduate students (e.g., admissions, examinations, thesis defenses); roles that graduate students might hold within the institution (e.g., as researchers, teaching assistants, and peer mentors); professional development opportunities available to all students; and, values and behaviors expected from all students, faculty, and SAP as members of the community. Collectively, these approaches could shed light on the skills that students need to successfully navigate graduate school and could help reduce inequities within the higher education system (Pensky et al., 2021), while promoting academic engagement and thriving. (Le et al., 2021; Wu et al., 2025). Academic thriving refers to a state of mind where the student is capable of experiencing academic growth and a sense of vitality, which is usually reflected in the students' ability to cope with challenges while feeling motivated (Wu et al., 2025).

(6) Develop a transparent and clear process for reporting experiences of discrimination and/or bias. The institution should establish a step-by-step process for students to report cases of discrimination, bias, or other forms of prejudice. This process should be clearly articulated and involve unbiased parties (e.g., designated SAP without conflicts of interest with faculty) who can serve as mediators between students and advisors. Similarly, the institution should establish appropriate sanctions for those who engage in discriminatory behaviours, regardless of their tenure or leadership status. This approach is critical given that these experiences can lead to program delays and students are less likely to report cases of discrimination if they perceive that the institutional response to these cases will be inadequate or ineffective (Wilkins et al., 2023). Therefore, it becomes important to implement institutional change efforts to report cases of discrimination.

4.2 Potential Implications for Student Affairs Professionals

The role of SAP in Canada has increased substantially in recent decades and, currently, these professionals are a primary contributor to student experience, learning, and development (Cox & Strange, 2010). At the graduate level, SAP (such as graduate program coordinators and administrators, career advisors, graduate student union employees and representatives, librarians, learning specialists, graduate curriculum officers, student development specialists, wellness navigators, graduate residence staff, graduate admission officers, among others) are directly or indirectly involved in various aspects of student development and may witness some of the barriers to inclusion described herein. Depending on their role and expertise, SAP could be involved in implementing recommendations to reduce experiences of inclusion barriers in graduate studies (e.g., developing financial aid materials; keeping abreast of equity, diversity, inclusion, accessibility and mental health training opportunities; supporting networks and mentorship initiatives; developing and streamlining clear communications; helping make the 'hidden curriculum' visible). In addition, advocating for students, working on their own professional development, and participating in research and program evaluation related to graduate student affairs, represent excellent ways for SAP to be involved.

Importantly, we argue that SAP could use SDT as a framework to critically think about how the barriers to inclusion in graduate school may shape student development (Figure 1). For example, an insufficient culture of inclusion, discrimination and bias, and unequal access to opportunities may make graduate students think about how their own values and interests align with those of academic institutions, thereby influencing the way students develop their integrity and sense of belonging with their institution, discipline, and profession. Unawareness about campus resources and services may leave students alone in coping with the pressures of graduate school, likely affecting the way students learn to manage their emotions and feelings and build professional and personal relationships at university. Financial inequities will likely affect the development of intellectual and interpersonal competence, as some students cannot access all opportunities that graduate programs have to offer. Some barriers to student well-being, such as mental health challenges and poor student-advisor relationships may have an influence on the way students develop mature interpersonal relationships, build self-directedness, and develop independence. Furthermore, a poor student-advisor relationship can directly influence graduate students' professional development and vocational pursuits. Barriers at the recruitment and admissions stage may exclude students with potential from graduate school, perhaps interfering in the way they develop and pursue their purpose and vocation. Discrimination and bias, as well as accessibility challenges, can potentially interfere with all aspects of development, but may especially leave a mark in the way students develop their identity, and their own idea of self and self-acceptance. Reflection upon these potential links between barriers to inclusion and student development may shed light on interventions that improve the overall graduate student experience.

4.3 Limitations and Future Directions

Limitations of the current study are generally related to data accuracy and generalizability. The online survey response rate was low with only 13.5% of the biological science graduate student population submitting the survey. As such, this study may not accurately capture the perspectives and experiences of the sample population and the extent to which the results can be generalized to the broader graduate student population is not clear. An additional consequence of a low response rate is that it can artificially inflate results. Findings that 46% of graduate experienced instances of discrimination and/or bias reflected only 6.3% of the graduate student population in the College, and therefore, the incidence of experiencing discrimination or bias was likely much lower across the larger graduate student population. The findings from the current study were also conducted within a single College at one mid-sized Canadian university, therefore, may not be broadly generalizable to across institutions and academic disciplines.

Future studies assessing graduate student barriers to inclusion across academic disciplines that include both smaller and larger institutions will capture both the unique context-dependent barriers to inclusion that impact a smaller number of graduate students and the overarching barrier experiences that are shared by the majority of graduate students. In the current study we used the framework of SDT to recognize that the time spent in graduate studies can represent a critical stage in graduate students' development (Gansemer-Topf et al., 2006), and therefore, experiencing barriers to inclusion and/or engagement in any aspect of graduate studies (namely, any physical, psychological, institutional, cultural, or social factors that may prevent students from fully engaging in various aspects of their graduate experience), may hinder students' development in any of the seven SDT dimensions. Having identified barriers to inclusion in graduate studies, future studies should evaluate how the experience of each inclusion barrier, alone or in combination, affects one or more of the seven SDT dimensions (Chickering & Reisser, 1993; Jones & Abes, 2013), which were not evaluated herein. This information could help inform graduate program supports or training initiatives that extend beyond advanced discipline-specific knowledge and critical skill development (Perez et al.,

2020). Furthermore, a greater degree of analysis of the intersectionality between graduate student demographics and the experience each inclusion barrier, which was not evaluated in the current study, but could be used to support vulnerable graduate students and inform targeted graduate program supports or training initiatives to better meet the complex needs of graduate students.

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