Excellence in Interdisciplinary Doctoral Programs

Report, December 4, 2021

Task Force on Excellence in Graduate Programs, Canadian Association for Graduate Studies (CAGS)

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1. Goals of the Report

In late December 2018, a Task Force was created by the Canadian Association for Graduate Studies (CAGS) to investigate and produce a report on Excellence in Graduate Programs. Members of the Task Force were assembled over Winter 2019. The Task Force sought to identify challenges and opportunities faced by Canadian universities aiming to ensure high quality and relevant programs – both research-based and professional - for students. In order to assist in identifying areas of particular interest to CAGS members, the Task Force hosted a panel discussion at the 2019 CAGS meeting in Saskatoon. Questions were asked of participants. In response to a question that asked them to rank areas of highest priority for task force recommendations, the highest rated option (at 59%) was to bring PhD curriculum into the 21st century, in terms of skill development for collaboration and community engagement. In reviewing the literature, one of the areas of focus identified by the members of the Task Force as worthy of further research, was excellence in Interdisciplinary Doctoral Programs. This report discusses relevant literature, develops a lifecycle methodological approach to analysis, and discusses findings arising from interviews with a cross-section of Vice-Provosts, Deans, Associate Deans and Administrators of Graduate Studies. Recommendations for practices and approaches that strive to create excellence in programs follow from the literature review, our conversations with colleagues who are involved with the administration of interdisciplinary programs, and our own observations. These recommendations touch upon all areas of the graduate student lifecycle from recruitment to convocation and, while focused specifically upon Interdisciplinary Doctoral Programs, we find that many apply equally to disciplinary Doctoral programs.

The definition of "excellence" in graduate programs is multi-faceted. This presents a challenge since excellence may mean different things to different stakeholders. These include graduate students, faculty members, administrators, and society, in a broad sense. For example, one definition of excellence is that graduating students are well positioned for successful and/or more diverse careers because they have developed skillsets (Including communications, leadership and community engagement) that are in demand. However, excellence from a student's perspective, in the specific case of interdisciplinary programs, might also be defined as the ability to undertake novel research that spans several disciplinary fields. Or, alternatively, it might be defined as having an opportunity to forge the pathway to a doctoral degree in an area that combines one's current or previous career experience with research. When it comes to faculty members, excellence might be defined in terms of creating conditions that support collaborations with students and colleagues in other disciplines on research that cuts across disciplines. Alternatively, it might mean nurturing the development of independent thinking and building leadership skills. These skills can be used to find solutions to real world complex and wicked problems requiring innovative and collaborative solutions (Jacob, 2015; Borrego & Newswander, 2010; Gardner, 2011). Alternatively, the definition of excellence might be considered in terms of establishing

research teams to compete at the highest level for research funding. From an administrator perspective, excellence might mean robust programs that attract award-winning students, revenues and research funding, as well as, support students to graduate in a timely manner.

Finally, from the perspective of broader society, Woolf (2017) noted the need for countries to pursue interdisciplinary research to tackle questions that require knowledge from science, social sciences and humanities for successful resolutions to challenging world problems. Combining these disciplines and using them in novel ways might accomplish another of society's goals of achieving excellence in interdisciplinary doctoral programs. Namely, by encouraging students who might not normally pursue disciplinary research programs to embrace a more holistic approach to their research, interdisciplinary programs may support equity, diversity, and inclusion (EDI) initiatives through inclusivity.

If we recognize that excellence can be defined in a number of ways, then we are embracing a notion of inclusive excellence (Williams, Berger, & McClendon, 2005). In their article, they focus upon American affirmative action programs aimed at creating a more diverse student and faculty population at institutions of higher learning. They argue for a multilayered approach. Their definition has four primary elements:

- "A focus on student intellectual and social development
- A purposeful development and utilization of organizational resources to enhance student learning
- Attention to the cultural differences learners bring to the educational experience and that enhance the enterprise
- A welcoming community that engages all of its diversity in the service of student and organizational learning" (p. vi)

These components are largely student focused. However, by serving students' needs, interdisciplinary programs can also serve the needs of other stakeholders. This perspective, along with our review of the literature, has provided guidance in establishing the approach and methodology employed to examine excellence in interdisciplinary doctoral programs. Specifically, we developed a framework defined by the lifecycle of the doctoral student from marketing/recruitment through admissions to completion of required components and beyond graduation. We detail our methodology in a later section of the paper.

During one interview, we were asked how we defined excellence. In turn, we posed this question to the interviewee. Since we were focused upon interdisciplinary programs, this was the context in which the interviewee answered. Namely, the interviewee noted that the program does not focus explicitly upon excellence per se. Rather, it tries to highlight the significant contribution that interdisciplinary research can make in solving

urgent societal problems. As discussed in the next section, this definition is similar to discussed in Gillis et al (2017).

Before turning to a brief description of the history of interdisciplinary programs, our rationale for choosing to focus upon them is three-fold. There has been an increasing interest since the mid-1950's from every type of stakeholder. They face the same challenges to be excellent as disciplinary programs but have additional challenges in their pursuit of excellence. They offer additional benefits to every stakeholder beyond traditional disciplinary programs. By investigating interdisciplinary programs in depth, we hope to learn lessons that can be applied to examine excellence for all types of doctoral programs.

Key recommendations

Fuller descriptions and rationale for these recommendations are presented in Section 6.

Recommendation #1: Provide prospective interdisciplinary students with support such as webinars/workshops/access to graduates or current students, as well as faculty, to assist in both the preparation of an application and the skills needed to secure supervisors.

Recommendation #2: Employ a central unit that has responsibility for both admissions and post-admissions administration.

Recommendation #3: Introduce and/or maintain regular outreach with students in the program.

Recommendation #4: Require students and (encourage) faculty to participate in interdisciplinary seminars throughout the program.

Recommendation #5: In less structured programs, conduct a review of the course requirements for students over the past 5-6 years to ensure overall requirements are consistent with university norms and quality assurance standards.

Recommendation #6: Allow flexibility in the nature of the dissertation.

Recommendation #7: Award dissertation fellowships.

Recommendation #8: The Dean or Vice-Provost of Graduate Studies should be the university champion for interdisciplinary programs

Recommendation #9: Develop supports that are unique or tailor-made to fit interdisciplinary programs and ensure that current students are made aware of the full range of support available to them.

Recommendation #10: Develop a mentorship model to encourage participation of new faculty (either junior or from different faculties) in interdisciplinary supervisions.

Recommendation #11: Clearly articulate competencies and skills obtained from participating in an interdisciplinary program.

Recommendation #12: Construct and maintain an online database of Canada's interdisciplinary doctoral program offerings

Recommendation #13: Create a network of faculty and administrators of interdisciplinary programs for the purposes of sharing strategies, practices and challenges.

The report is structured in the following way. In Section 2 we present a brief history of the development of ID Programs, both in Canada and other countries and a review of the literature highlighting themes, characteristics, challenges, and opportunities that other researchers have noted about Interdisciplinary Doctoral programs. We identify the types of programs available in Canada and highlight issues around lack of data and consistency in how they are defined. In section 3, we present our methodology, which involved interviewing colleagues who generously provided their time and knowledge. We then summarize and synthesize our findings. Recommendations on how to achieve excellence in Interdisciplinary Doctoral Programs are discussed in Section 5. References follow the recommendations. An appendix contains the full set of materials that we sent to colleagues prior to interviews, as well as a series of tables that provide data obtained from interviews.

2. **A Brief History and Literature Review of Interdisciplinary Doctoral Programs**

Over the last two decades, educators have increasingly criticized academia for the paucity of interdisciplinary doctoral programs (Kates et al., 2011). This is not a new complaint. Kells and Stewart (1968) wrote about how graduate education in interdisciplinary studies in the United States was lacking, in particular because they felt interdisciplinary doctoral work would increase the excellence of teaching especially at liberal arts colleges. They then described an experiment that had been taking place at several California institutions since 1955. This was "a collaborative effort to conduct a program of interdisciplinary doctoral study" (p. 2). Specifically, " …the program was designed for able students in the humanities and social sciences who wished to add a broader learning and perspective to the knowledge and techniques required for the Ph.D. in their respective areas of concentration" (p.2). Students were required to take their usual disciplinary courses/seminars and participate in a number of interdisciplinary seminars. Their preliminary examinations tested their knowledge in five areas. Finally, the scope of the dissertation was supposed to be "relevant to the candidate's preparation to teach undergraduates". (p. 2) Sadly, funding for the program was ended

and the program was abandoned. In their analysis of the program, Kells and Stewart (1968) highlighted two factors: lack of institutional support due to other priorities and "no continuous, effective, administrative effort for the program". This was exacerbated by the fact that several institutions were involved without any of them having sole responsibility for program success.

This early failure did not stop the further development of interdisciplinary doctoral programs. The United States National Science Foundations' IGERT (Integrative Graduate Education and Research Traineeship) program began in 1997. In contrast to the intentions of the early California program, the IGERT program was concerned with developing science and engineering focused interdisciplinary programs, largely to promote research into challenging environmental problems. This program has been the subject of many articles that have reviewed its progress, challenges, and successes (e.g., Manathunga, Lant, & Mellick, 2006). And, some of the lessons from this program have been adopted by other institutions across the world. Interdisciplinary doctoral programs are now available in Canada, the United States, Australia, the United Kingdom, and most European countries. While the majority are rooted in science, medicine, and engineering disciplines, a number embrace social sciences and humanities disciplines.

Canada's first interdisciplinary doctoral program turned 50 years old in 2021. The University of British Columbia began offering its PhD in Interdisciplinary Studies in 1971 (Saliba, 2012 and personal communication Taubeneck, 2021). Thirteen years later, Dalhousie began its program in 1984 (personal communication, Robinson, 2021)., universities in virtually every province offer interdisciplinary doctoral programs that take several different forms. A 2013 CAGS survey reviewed four types of interdisciplinary graduate programs available across Canada (Hall, 2014). Direct entry programs arise when two or more existing academic units co-design and administer a completely specified degree program, whereas, individually designed programs draw upon existing course banks to develop a unique student experience. Supplementary programs provide experiences in another discipline to students enrolled in a disciplinary program and non-degree offerings range from certificates to transcript notations.

Some Canadian institutions offer a single interdisciplinary program while other larger institutions offer many. Most institutions have chosen either the direct approach or the individually designed approach. However, the University of Toronto offers interdisciplinary opportunities for prospective doctoral students through two main mechanisms in order to foster interdisciplinary work in research, teaching and learning. (They have a policy *on Interdisciplinary Education and Research Planning, which* **describes the scope, procedures and accountability with regards to this work** (https://governingcouncil.utoronto.ca/secretariat/policies/interdisciplinary-education-and-research-planning-policy-february-1-2007).

First, the University has *extra departmental units* (EDUs) that "are flexible and multidisciplinary entities organized around emerging research and teaching areas that

span disciplines"(https://www.vpacademic.utoronto.ca/academic-units/extra-departmental-units/). These EDUs often offer their own PhD degrees, which by nature are designed to be interdisciplinary. The University of Toronto currently offers 30 multidisciplinary EDUs A and B. Second, the University offers *collaborative specializations* (https://sgs.calendar.utoronto.ca/search-cs). The earliest mention of collaborative specializations in the School of Graduate Studies Calendar dates to 1979-1980. Specific degree programs offer students an additional multidisciplinary experience (i.e., collaborative specialization), in conjunction with other units. This is generally achieved through the student taking a core course in a program outside the home degree program, participating in seminars that the collaborative specialization offers, and ensuring that the disciplinary focus of the collaborative specialization is incorporated into the culminating research requirement. Currently, the University offers 40 collaborative specializations; all faculties have some form of involvement with these offerings. In both cases, there are different admissions and program requirements depending upon the specific degree program or collaborative specialization. All graduate programs are adjudicated collaboratively by the School of Graduate Studies, which oversees regulation, the Vice-Provost, Academic Programs office, which oversees implementation and quality assurance, and the divisions, which oversee the conceptualization, operation, and resources.

Due to a lack of uniformity in how interdisciplinary programs are either defined or administered, it is challenging to find data. For one thing, there is no central database that identifies programs for potential students. For another, university websites take many different approaches to showcasing programs on a website. This poses a challenge to the individual seeking to find information about interdisciplinary doctoral programs. And, while the CGPSS data provides very helpful information on student responses according to several disciplinary definitions, it does not identify which respondents are undertaking an interdisciplinary doctoral degree, which limits extant information about interdisciplinary student experiences. However, Hall's survey (2014) found that Individual and Direct Entry programs were equally common in institutions to Western and Eastern Canada, but that direct entry programs were more prevalent in Quebec. These direct entry programs virtually dominated in Ontario, possibly because of challenges presented by requirements of the Ontario Quality Assurance Framework approval process that hampered the development of direct entry interdisciplinary programs.

The concepts interdisciplinary and interdisciplinarity are sometimes used synonymously in the extant literature and refer to the infusion or use of multiple disciplines or fields to conduct research, instruction, or certification. Jacob (2015) notes that there are different kinds of interdisciplinary programs in postsecondary education such as multidisciplinary, transdisciplinary, and participatory interdisciplinarity. However, one aspect that continues to challenge interdisciplinary programs is the absence of agreement on what exactly constitutes an interdisciplinary approach and confusion over how the terms multidisciplinary and transdisciplinary are related to it. Gillis et al. (2017)

define these terms with reference to what they call "intradisciplinarity", that is, when knowledge builders (experts in their own sub-discipline) work together with experts from another sub-discipline on projects that are within the scope of a single common discipline. A multidisciplinary team, on the other hand, combines the specializations of a group of intradisciplinary members to achieve a common goal without the sub-goal of building new knowledge. Finally, interdisciplinarity requires collaboration by knowledge builders from at least two disciplines in order to solve a problem that requires a methodology that is not discipline-specific. Gillis et al. (2017) further note that transdisciplinarity results when knowledge builders from at least two disciplines work "together to transcend their disciplines, to develop a space for viewing a problem in a completely different way" (p. 206). Interestingly, these notions of interdisciplinarity and transdisciplinarity are viewed as complementary in (Lyall et al., 2008). They note, "Interdisciplinary research is not a single, homogeneous entity but takes different forms depending on the research question". They go on to state that this can take the form of either research that pushes the boundaries of individual disciplines and allows for the creation of new sub-disciplines or else is problem focused aiming to find solutions to a large range of policy-oriented issues.

The focus of interdisciplinary research on innovative solutions to complex problems encourages post-secondary institutions to investigate offering new or expand existing programs. The benefits of these programs include new discoveries that arise only because of cross-disciplinary studies, expanding career options for students in new and emerging fields, creative solutions that solve complex problems, and the development of essential skills such as critical thinking, and the ability to analyze issues from multiple lenses. Additionally, academe, industry, and funding agencies' demands for interdisciplinary skills and experience (Sabbahi & Sindi, 2017; Martin & Umberger, 2003) strengthen the case for the growth of interdisciplinary programs in post-secondary institutions. Even though there has been increasing interest in and steady growth of interdisciplinary programs in higher education, a plethora of challenges abound.

Jacob (2015) claims that the traditional structure and culture of higher education (specifically disciplinary-specific programs) present some challenges for the vitality of interdisciplinary programs. Such challenges include the silo syndrome, hindrances to research collaborations, as well as conflicts that arise from traditional funding structures, and the tenure and promotion process. For example, given the traditional funding structure of most higher education institutions, the presence of multiple supervisors in multiple departments can give rise to problems with respect to the flow of funds from one department to another. Another challenge that arises with the pairing of faculty from multiple disciplines in these programs is the team-working tensions described by many organizational theorists. Such tensions and potential differences in expectations pose a challenge to the students' time to completion, quality of work, success, among other challenges. Jacob (2015) also suggested that this problem might be mitigated when factors such as 'person-to-person fit' and chemistry are considered when structuring interdisciplinary teams, which should ultimately lead to Tuckman's

(1965) performance criterion efficiently. According to Nancarrow et al. (2013), the following traits are essential to the success of interdisciplinary teams: effective communication; effective leadership and management; personal rewards training and development; appropriate resources, procedures, and skill mix; positive and enabling climate; clarity of a shared vision; quality and outcomes; and respecting and understanding roles.

Given the need for interdisciplinarity within the higher education research space and the potential benefits of successful interdisciplinary programs, there is a current trend of moving away from solving research problems through a single disciplinary-specific perspective to addressing new and emerging research problems through multiple or interdisciplinary lenses (ASHE, 2005; Adams et al. 2014). Greater value overall is being placed on research conducted across multiple disciplines, to the extent that funding institutions are increasingly placing cross disciplinary collaborations as an important criterion for some research grants and competitions in academia. Therefore, post-secondary funding sources such as the Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC), and the National Science Foundation (NSF) invest significant resources ($millions) in support of research that crosses cultural, national, and disciplinary boundaries (Martin & Umberger, 2003; Borrego & Newswander, 2010; Gardner, 2011; Gillis et al., 2017). Further, some research problems that have a significant global reach or impact or are very complex in nature require a more holistic approach for example, HIV/AIDS, environment and sustainability, and climate-related topics. The literature also reveals that these interdisciplinary topics are also increasing in popularity among current and potential students, which has resulted in a rapid growth in student demand for and enrolment in these programs (Vincent, 2015; Buss, 2003). As a result, many states and institutions, such as funding and non-government agencies, underscore the importance of an interdisciplinary approach to addressing these challenging problems via their support and promotion of interdisciplinary research.

3. Methodology

The previous section highlights the key lessons learned from the literature review on interdisciplinarity in higher education. In parallel, a systematic environmental scan was conducted on interdisciplinary programs across Canada and current themes in interdisciplinary programs. Together, they informed the approach used in this study and guided the development of the interview protocol and subsequent interviews with stakeholders at a small sample of post-secondary institutions across Canada.

The aim was to target post-secondary institutions from each region (Western, Central, and Eastern Canada). The following universities participated in the stakeholder interviews conducted in April 2021:

- University of British Columbia – 1 Administrator, 1 Chair of the Interdisciplinary Studies Doctoral Program
- University of Saskatchewan – 1 Associate Dean, Policy & Program Innovation, 1 Co-chair, Interdisciplinary Studies, 1 Administrative Support, Interdisciplinary Program
- Concordia University – 3 Directors of 2 types of IDP programs: 1 Director, Individualized Program; 1 Director, Centre for Interdisciplinary Studies in Society & Culture; 1 Program Director, Humanities PHD
- Dalhousie University – 1 Director, Interdisciplinary PhD program
- University of Alberta – 1 Vice Dean, Faculty of Graduate Studies & Research
- Brock University – 1 Vice-Provost and Dean, Faculty of Graduate Studies, 1 ex-Interim Dean, Faculty of Graduate Studies

In addition, a member of our Task Force, Vina Goghari, Vice-Dean, Research and Program Innovation, School of Graduate Studies, University of Toronto, provided information and insights into the means by which the University of Toronto supports interdisciplinary doctoral education. A total of 9 interviews were conducted with 12 participants who were Interdisciplinary Program Directors or Chairs, Associate Deans or Dean/Vice-Provosts, Deans of Graduate Studies or Program Administrators. Each interview lasted approximately 1 hour with follow-up communication/s where needed. In advance of each interview, participants were provided with the background to the study and interview protocol at least 1 week prior to the meeting/s. Participants were able to prepare for the interviews and submit provisional responses prior to interview sessions. A common framework was used, which guided the data collection and analysis processes known as the lifecycle approach. This framework mapped the critical areas of consideration for an interdisciplinary program from the recruitment and marketing phase through to the post-graduation support phases of a doctoral program. Interdisciplinary programs in the various institutions were reviewed against this framework during the data-gathering phase. This framework also provided the basis upon which comparisons were made across programs in the sample population. The appendix contains the initial participation request email, along with the interview protocol that describes the sample lifecycle framework and poses specific questions to interviewees. It also contains nine tables that provide details on the programs organized according to the lifecycle framework.

A further consultative process was the hosting of a two-hour webinar on September 21, 2021. Interdisciplinary stakeholders (including students, program Directors, Deans, Associate Deans, Faculty Members and Administrators) from Canada and the United States participated in the webinar. The webinar's objectives were to share the initial findings and recommendations from the study, as well as to create a space for further discussion of best practices in interdisciplinary programs, obtain feedback on the initial findings, and facilitate networking among stakeholders. The webinar had a total of 105 registrants, and 72 total attendees, creating an in-seat ratio of approximately 70%, which is above typical industry standards.

The format included an overall presentation on the study's outcomes, a panel discussion (led by interdisciplinary program experts from four post-secondary institutions in Canada), followed by a question-and-answer segment and three (3) break-out room sessions. The topics for the breakout room sessions were:

1. Which stakeholder/s in the university (role/department) should champion interdisciplinary programs and why?
2. Discuss the key components of an excellent interdisciplinary program from various stakeholder perspectives (from the students', administrators', institutions' employers' perspectives)
3. Should there be a national repository for interdisciplinary programs in Canada with information accessible by program developers, students, researchers, and other stakeholders? Discuss

The feedback from the webinar participants and a final accuracy of program details with interviewees informed this final report.

4. Findings: Similarities/Differences/Challenges/Opportunities

Using the lifecycle framework, we note responses by individual vice-provosts/deans/associate deans/ directors/chairs and administrators in tabular form (Tables 1-9 in appendix). In analyzing the responses, we identify both similarities and differences across programs, as well as challenges and opportunities highlighted. What emerges is a consensus around some **best management practices** that help to identify excellence in interdisciplinary doctoral programs and, by extension, excellence in doctoral programs broadly defined. *Comments in italics indicate either our subsequent observations or else those made by interviewees.*

Similarities

In general, there are no dedicated or targeted marketing efforts employed to advertise programs (beyond program web pages). Marketing typically seems to be done by a Graduate Studies unit for all programs. Some students are recruited from undergraduate or masters' programs, while others find the programs on their own. The program websites are quite detailed and provide a wealth of information for prospective students.

> *Websites themselves were not necessarily easy to find nor did normal searches point us in the right direction. This may limit both the supply of prospective students and hamper subsequent job searching for graduating students.*

Admissions standards are uniformly identified as rigorous. Applications have many requirements, and the process is described as lengthy. As part of the application process, the prospective student generally needs to identify and secure approval and

support of committee members, as well as provide a detailed plan for the proposed research program. The plan requires the prospective student to provide the rationale for pursuing an interdisciplinary approach, as well as explain how the various methodologies and knowledge areas knit together. In a number of cases, this requires the student to navigate differences in disciplines at or prior to the start of the program since they work with faculty from several departments. The number of departments involved varies, however, the University of Alberta, for example, does not allow more than two departments to be involved.

> *This upfront effort by the prospective student can be seen in both a positive and negative light. It is positive in the sense that a student must think about the research problem in detail, assisting them to become an independent thinker and researcher, as well as providing them with a committee from the very beginning of the program. It also gives them time to reflect upon whether undertaking such a program is their best path forward. It is negative to the extent that it may discourage students whose background experiences have not provided them with the skills needed to work autonomously. This, in turn, may result in less inclusiveness, equity and/or diversity and, ultimately, not serve broader societal goals.*

Once a student is admitted, programs require some form of comprehensive examination, a proposal or candidacy requirement, a dissertation, and a defence. However, programs differ in terms of course requirements, as noted in the observed differences that are presented in the next section. Most interviewees felt that 4 years for an interdisciplinary doctoral degree was too short. For the most part, students are subject to university-wide or Graduate Studies regulations. However, at the University of Alberta, regulations are program- and Faculty-specific with the Vice-Dean acting as a negotiator in the case of conflicts. At other institutions, the Faculty of Graduate Studies may be called in to negotiate if there are clashes over specific components (e.g., comprehensives).

> *Programs that are not housed within a Faculty of Graduate Studies require multiple reporting structures, which can add to administrative burden and lack of clarity around deadlines, milestones, and timelines. Differences in expectations also need to be managed throughout the program. Clear guidance is needed in dealing with conflicts. Communications around realistic timelines for program completion should be widely circulated. Checklists for students are a helpful mechanism. However, having interdisciplinary programs housed within a Faculty of Graduate Studies (as opposed to within a disciplinary Faculty) can also create a type of ambiguity since the Faculty of Graduate Studies also has oversight for all graduate programs.*

Co-supervisors are permitted in all programs, although one person is typically identified as the primary supervisor. Programs all require a minimum of three committee

members (including the supervisor) and allow the possibility for a member of the committee to be external to the university in order to add necessary breadth. In some programs, committee members must be drawn from core faculty to the program while other programs allow all faculty members to participate.

> *Requiring one individual to be identified as the primary supervisor may lead to difficulties if supervisions outside one's department or faculty are not recognized by either University administration or one's Chair or Department. The challenge is that most universities' finance/resourcing models are organized around the departmental/faculty level and, almost without exception, interdisciplinary programs do not fit into that structure. For the most part, supervisors come from individual departments/centres and must answer to a Faculty Dean for issues such as course load, recognition for supervision, etc. In addition, disciplinary supervisors need to be well-informed and very careful to set meta-interdisciplinary expectations, as opposed to disciplinary expectations. Finally, to encourage junior scholars to participate in interdisciplinary dissertations, a university needs to have a dedicated core of more experienced faculty members who are willing to lead. This is especially important to counter pressure faculty might face that could discourage them from taking on students outside their discipline. Finally, having external members can be very helpful for future career development by introducing students to outside opportunities and networks.*

Non-academic supports (including health and wellness and professional development) are not tailored specifically for interdisciplinary students. Rather, they piggyback either on resources for all graduate students or both graduate and undergraduate students. Every program noted the absence of either any dedicated space or a large enough physical space for graduate students in the program. Interviewees felt that this leads to students feeling isolated, although a number noted that interdisciplinary students are generally comfortable working independently. Most felt that students in interdisciplinary programs tend to be slightly older or more mature than the average doctoral student, and that the challenging nature of interdisciplinary programs leads to longer completion times. In general, withdrawals are rare but typically occur after course and comprehensive requirements are satisfied. None of the programs has dedicated resources earmarked for interdisciplinary post-graduate support, so students need to rely upon supervisors and committee members for career counseling and job application support letters.

> *By their very nature, interdisciplinary programs require the doctoral student to be more autonomous than is usual in a disciplinary program. The absence of dedicated non-academic supports, including physical space, may lead to feelings of isolation. Students who do not have a good supervisory experience may not be able to draw upon the same resources as students whose supervisors are more supportive. The negative aspects of poor supervision may compound well past*

graduation. Program Directors have a role to play in providing reference letter support.

Universities need to have a mindset shift regarding post-graduation support for interdisciplinary students. Specialized counsellors may be able to assist by providing extra support. Alternatively, a program director can work with students on a one-to-one basis to help develop a plan (similar to an Individual Development Plan, as required by the University of Alberta for every graduate student). This may include encouraging students to take professional skills certificates.

Concordia allows students to take up to 6 leaves without question while UBC allows up to 24 months. Most other institutions allow a maximum of 2 leaves and require supporting documentation. These requirements can raise the psychic cost to students who are struggling with either mental health issues or other life challenges. A more holistic view of the student lifecycle would encourage balance and perhaps change the mindset of the new graduate entering both academic and non-academic careers.

Programs are typically reviewed using the same approach used for disciplinary programs. For example, all programs in Ontario are reviewed every seven years and follow the Institutional Quality Assurance Process (IQAP).

One challenge that interdisciplinary programs face is that quality assurance draws upon a framework that has been informed by the traditional disciplinary structure common to most academic institutions. Given the unique aspects of interdisciplinary programs, it may be difficult to find appropriate examiners. In addition, the metrics that are used (e.g., faculty publications, student enrollments, etc.) may not be the ones that best describe excellence in an interdisciplinary program. For example, some of the newer interdisciplinary focused journals may not have the reputation and weight of disciplinary-focused journals.

Differences

Several interviewees noted that interdisciplinarity has been identified as a strategic goal or mandate for their university. Operationalizing interdisciplinary doctoral programs has been pursued in various ways. Their structures range from the creation of a stand-alone interdisciplinary studies program housed within Graduate Studies (as at UBC, University of Saskatchewan and University of Alberta, and Dalhousie) to a single Interdisciplinary Humanities program housed within the Faculty of Humanities (as at Brock). UBC, University of Saskatchewan and University of Alberta also allow for other interdisciplinary opportunities that are housed within individual faculties and, for the most part, governed by the regulations associated with those faculties. Concordia is

unique in that it has both an Interdisciplinary Studies program that allows students to pursue research either within a faculty or across faculties but also has a PhD in Humanities that offers degrees in Interdisciplinary Studies in Society and Culture (and is part of the Centre for Interdisciplinary Studies in Society and Culture).

> *As a result of this diversity in approaches, areas of study tend to differ. UBC, University of Saskatchewan, and University of Alberta tend to see a larger number of students pursuing interdisciplinary work from science, medicine, and health backgrounds. Brock and Concordia's programs are more focused in nature and attract students from arts, social sciences and humanities backgrounds. Dalhousie's students are a mix of these various disciplines. A challenge is that scholarship processes and divisions may provide extra challenges to prospective interdisciplinary students whose proposed research falls between disciplinary and Tri-Council divisions.*

> *Finally, university administration both provides the foundation and structure for the creation of interdisciplinary programs but can also impede their development through the existence of artificial boundaries that support existing programs and disciplinary structures.*

With the exception of the University of Alberta, either a single Advisory or Program Committee assesses applications. For some universities, these committees are housed within Graduate Studies while others reside within a program/centre. There is typically a chair (Director or Graduate Program Director) and membership is either drawn from core faculty or else from university faculty who have interest in interdisciplinarity. At the University of Alberta, each proposal for an individualized interdisciplinary graduate program is reviewed by each of the individual departments represented in the application. Each department must approve, and the student must be admitted to each department.

> *Requiring each department involved to review applications may lead to delays in admissions decisions and, unless the process is clearly identified to prospective students, they may accept offers elsewhere. Having different rules apply may also lead to confusion for prospective applicants.*

Most programs are direct entry but the University of Alberta, for example, allows students to transfer into their individualized interdisciplinary graduate program, no later than six months prior to candidacy. In addition, some programs (e.g., University of Alberta, UBC, Concordia's INDI) have interdisciplinary masters' programs that may serve as recruitment vehicles.

> *Direct entry programs lead to clarity of expectations and timelines at the outset of the application process.*

Funding and resourcing is another area where we see differences. UBC benefits from having the oldest interdisciplinary Studies program in Canada with a Program Chair (who is a faculty member on reduced teaching load), as well as a full-time administrator and an assistant. Concordia's Individualized program has a Director who spends a major part of the time advising students. Dalhousie also has a Director with some administrative support. At the University of Saskatchewan and the University of Alberta, administration is largely done within the office of the Dean of Graduate Studies.

At UBC, students must be offered a funding package of a minimum of $22K per year for four years by their prospective supervisors. This approach does face challenges since students may not be eligible for certain types of funding that requires being enrolled in a specific discipline in a particular Faculty. However, there are possibilities for direct funding from the Interdisciplinary Graduate Studies Program. By contrast, Dalhousie requires applicants demonstrate that they have at least two years of required funding committed, with funding coming from a combination of sources (including scholarships and faculty funding). A limited amount of funding comes from the Faculty of Graduate Studies to support students from years 3 onward on the basis of need alone. Like UBC, Brock also offers four years of funding, however, the Faculty of Graduate Studies provides the money. Amounts depend upon whether the student is domestic ($13.5K) or international ($23.5 K). University of Saskatchewan and University of Alberta have no minimum funding requirement, however, individual colleges may not accept students without funding support. At Concordia, funding for PhD Humanities students comes from Graduate Studies and either the Faculty of Arts and Sciences (for students whose faculty supervisor has that affiliation) or the Faculty of Fine Arts (for students aligned with this program). While Graduate Studies provides a good level of funding (particularly in relation to tuition for Quebec students), the funding is only for 4 years. The normal time to completion for students is 5 years. In addition, given the relative sizes of the two faculties, support is very different for interdisciplinary students depending upon their research. Funding for Individualized Doctoral students comes from Concordia's School of Graduate Studies.

Access to office and/or studio space is generally dependent upon the specific supervisor or composition of the supervisory committee.

> *The nature of interdisciplinary programs adds to additional challenges, particularly around funding and resourcing. Budgets are typically tied to faculty enrollments, particularly at the undergraduate level. When interdisciplinary programs are located within Graduate Studies, a dedicated source of student funding helps create certainty for students, however, this is not uniformly available or else of insufficient quantity. When it comes to offering TAships to interdisciplinary students as part of an offer, programs that do not have undergraduate or Master's level course offerings face challenges in not having a ready supply of TAships.*

Having administrative support to do communications and outreach to interdisciplinary students can be beneficial in terms of helping them navigate feelings of isolation.

Finally, there are large differences in program structure as related to courses. UBC, at one end of the spectrum, has no required courses or course load, nor does it have a specific curriculum structure for students pursuing an independent studies program. Given its decentralized structure, the University of Alberta presents the largest variation with some students in the Individualized Interdisciplinary Doctoral program having no required courses and others with some number, dependent upon the specific disciplines involved. Sometimes, negotiations over the exact number of required courses are required as part of the application process when the participating departments have different requirements. Dalhousie requires a minimum of 4 courses while Concordia's PhD HUMA requires 2 core seminar courses and 4 additional courses in a very targeted and systematically built program. Brock's program is similar in that it requires six half courses, with two compulsory courses, as well as proficiency in a language other than English. Given the nature of the doctoral work pursued in fine arts, Concordia's program offers a research creation project option and a studio comprehensive for students pursuing that option. This tends to attract mature students who have had a professional career in fine arts and wish to pursue a doctoral degree.

Despite this variation in program structure, interviewees generally felt that 4 years was insufficient for interdisciplinary students to complete their degrees. Others spoke about the need for professional development seminars that would expose students to researchers working in interdisciplinary fields. Other concerns raised concerns that included conflicts that might arise between required disciplinary quantitative and qualitative approaches in courses taken by students across different disciplines. A required course (or set of seminars/courses) to reflect how best to conduct interdisciplinary research and perspectives might be advisable and help to create some type of cohort for these students.

While all programs require some form of comprehensives and dissertation, differences exist in both the scope and nature of what is required, and this may cause challenges when different disciplines are involved. At UBC, it has been past practice for the Faculty of Graduate Studies to negotiate when there is a clash over comprehensives, although it was noted that the office has had very little by way of veto power. However, the program has recently redesigned its comprehensive exam format and posted guidelines online. Concordia's PhD HUMA has systematically built its program and core seminars to explain what each student must learn from a particular topic and the disciplinary orientation of each specific seminar. Comprehensives in each of the 3 fields of the supervisor are required, however, one comprehensive can be a studio comprehensive for students undertaking a research creation project. Generally, there is a great deal of flexibility allowed to students in the program but the scope of the dissertation can produce the biggest disagreements and the Individualized program office will be

involved as a last resort. Similarly, at Brock, 3 comprehensives (two written) and 1 oral are required with separate committees for each exam. Students participate in submitting reading lists for written exams but are also required to include items from standard reading lists. At Dalhousie, the student's committee determines the nature of the comprehensive, following overall university guidelines. The committee also determines the proposal format. At the University of Alberta, the challenge posed by departmental autonomy is for Graduate Studies to review admissions applications to ensure that the structure of the student's interdisciplinary program does not involve fulfilling the requirements for two separate degrees.

> *An interdisciplinary dissertation reveals the challenges inherent in doctoral research. On the one hand, the goal is for students to produce a body of work that is novel and contributes to the existing knowledge base. For disciplinary doctoral students, this is done within the boundaries of one's disciplinary norms. For interdisciplinary students, methodologies are more varied in scope, and dissertations are generally the result of conversations and negotiations between students and supervisory committees. Realistically, one should not want to put boundaries upon the nature of the dissertation, nor its form, for fear that novelty could be stymied. However, when there is a large gulf between disciplinary expectations regarding the scope of a dissertation, the student can be caught in the middle. This is where administrative oversight from a neutral party (such as a unit like Graduate Studies) can provide the negotiating skills to find solutions agreeable to all parties. The challenge is striking a balance between encouraging novelty and innovation and making the dissertation doable within a reasonable timeframe. Drawing upon the experience of successful interdisciplinary supervisors to provide guidance and support to junior colleagues can help create the change in mindset that can allow interdisciplinary research to flourish. This could take the form of the development of core faculty who apply for permission to supervise.*

Universities and programs differ in how students either participate in academic experiences or develop non-academic skills. UBC holds an annual conference at which interdisciplinary studies students present their research. The Director of the Dalhousie program created a new program this year to train students in public outreach and students have been encouraged to participate in the OpenThink program. The University of Alberta requires students to take professional development courses and create an Individual Development Plan while the University of Saskatchewan, Concordia, Dalhousie, and Brock encourage students to take advantage of generic professional development opportunities aimed at all graduate students.

> *Given the confusion that exists around how to define interdisciplinarity and whether this definition embraces multi- or trans-disciplinarity, a suite of skills or experiences that can help interdisciplinary students navigate both the academic*

and non-academic landscape would assist them in their post-graduation career goals.

Challenges

As noted by one interviewee: Universities should create interdisciplinary doctoral programs, fund them, and support them. Programs have been created, however, given their uniqueness they would benefit from different forms of marketing in order to draw in potential applicants. The funding aspect is perhaps the most challenging given the typical budget structure of a university. Supporting these programs requires financial support to students and provision of resources needed to run programs, as well as mindset shifts around barriers to the development of new lines of inquiry that transcend traditional disciplinary boundaries. Support can also take the form of reducing administrative (e.g., duplication of efforts) barriers that may arise when interdisciplinary programs are overlaid upon an existing disciplinary program structure. This can help with providing clearer guidance for dealing with conflicts that can be magnified when more than one department is involved in disputes. In the end, as several interviewees noted, the culture of the program needs to be considered in the design phase to create the right conditions for all those involved to feel supported.

Opportunities

In order to create the conditions for interdisciplinary doctoral programs to flourish, our analysis suggests the following three opportunities.

First, to assist potential students to investigate and research interdisciplinary doctoral programs, the construction and maintenance of an online database of Canada's offerings would benefit all stakeholders. By lowering the transaction costs to potential students, the database could assist in achieving goals of equity, diversity, and inclusiveness. Moreover, the database could provide information for graduating students, counselors, and supervisors as to potential and career opportunities. The database could encourage the creation of a network of individuals involved with interdisciplinary programs and facilitate the sharing of best management practices. Having such a database would also assist in data gathering by identifying the body of interdisciplinary students for the CAGS CPGSS survey.

Second, opportunities to assist in mitigating the inherent funding and resources challenges associated with interdisciplinary programs could include providing dedicated funding for interdisciplinary students by either the Provost's Office or the Graduate Studies Office. This funding would be budgeted separately from departmental/faculty funding. Furthermore, recognizing that these programs typically take 5 or more years, guaranteed funding for a fifth year could be provided by Graduate Studies, perhaps on a merit basis.

Third, additional non-academic support for interdisciplinary students during the program might reduce the sense of isolation. These could include reviewing existing support for opportunities to add material that is more directly relevant to the experience of an interdisciplinary student, such as developing and honing negotiating skills and broader forms of communications experiences. Requiring them to start an Individual Development Plan that is not just academic at the onset of their program and to revisit it with their committee on a regular basis would assist in goal setting and achievement.

Section 6. Recommendations

We have structured our recommendations around the lifecycle approach. These recommendations arise from our review of the programs, some suggested best management practices from the literature, and the recommendations of the interviewees who are most knowledgeable about these doctoral programs.

Marketing/Recruitment

Recommendation #12: Construct and maintain an online database of Canada's interdisciplinary doctoral program offerings.

Rationale: Websites were not easy to find nor did normal searches point us in the right direction. While this may be true for other disciplinary programs, they are generally easier to find with typical search terms. As well, faculty members are better informed about traditional program offerings. The absence of reasonably accessible information may limit both the supply of prospective students and hamper subsequent job searching for graduating students. By lowering the transaction costs associated with finding out information about interdisciplinary programs, the database could assist in achieving goals of equity, diversity, and inclusiveness. First, it could encourage a greater diversity of potential students applying for these programs. Second, the database could provide information for graduating students, counselors, and supervisors as to potential and career opportunities. Third, having such a database would assist in data gathering by identifying the body of interdisciplinary students for the CAGS CPGSS survey. This, in turn, could be used when working with government agencies and industry to find greater funding support for students. More explicit connections with local business and government organizations also provide benefits in terms of networking for students and faculty.

Recommendation #13: Create a network of faculty and administrators of interdisciplinary programs for the purposes of sharing strategies, practices and challenges.

Rationale: Given the diffuse nature of interdisciplinary programs, faculty and administrators involved in these programs can benefit from being able to connect with

their colleagues at other institutions. The network could serve as a means of sharing best practices, as well as information about enrollment numbers, types of programs, and areas of study. In addition, by agreeing to a common language of how to name such programs, it would be possible to capture trends in students enrolled in interdisciplinary doctoral programs in the CGPSS (Canadian Graduate and Professional Student Survey). Currently, there is no overall category to identify these students, so it is very challenging to analyze their survey responses to see how they may differ or be similar to those of students in disciplinary programs.

Admissions

Recommendation #1: Provide prospective interdisciplinary students with support such as webinars/workshops/access to either graduates or current students, as well as faculty, to assist in both the preparation of an application and the skills needed to secure supervisors.

Rationale: Skills and experiences required to successfully put together an application package may be unevenly dispersed amongst the pool of potential applicants and may be related to the size of the previous institution. There is a large transaction cost associated with applying to an interdisciplinary doctoral program. This is a positive in the sense that a student must think about the research problem in detail, assisting them to become an independent thinker and researcher, as well as providing them with a committee from the very beginning of the program. It is a negative to the extent that it may discourage students whose background experiences that have not provided them with the skills needed to work autonomously. This, in turn, may result in less inclusiveness, equity and/or diversity and, ultimately, not serve broader societal goals.

Post-Admissions Administration

Recommendation #2: Employ a central unit that has responsibility for both admissions and post-admissions administration.

Rationale: Having a central unit responsible for admissions and administration can both reduce the administrative burden and possible delays that may be associated with the involvement of multiple units within a university. In addition, this central unit may be best placed to provide clarity around expectations and offer on-going support to interdisciplinary students. This should help mitigate conflicts that may arise at each stage of a student's program. Such a unit would likely benefit from having a dedicated core faculty associated with the program. In addition, having a single central unit would make it easier for the financial and resource support to flow to the students. This requires a necessary shift in university administrative culture around how people think about interdisciplinarity on all levels

Recommendation #3: Introduce and/or maintain regular outreach with students in the program.

Rationale: By maintaining on-going contact with students, the administration can provide regular reminders to students about the steps they should be taking. This should include the provision of as much detailed information to students as possible in multiple, accessible formats. Checklists are very helpful, but the use of an online student information system dashboard - that clearly identifies the status quo of the student in the program with information about next steps and milestones - would be beneficial to all parties. This can allow timely monitoring of progress and intercession as needed. This is particularly important for students who are post-comprehensives since this is often the point at which they flounder.

Course Program Structure

Recommendation #4: Require students and (encourage) faculty to participate in interdisciplinary seminars throughout the program.

Rationale: Interdisciplinary seminars can help all individuals involved in the program to develop a better understanding of interdisciplinary inquiry, methods, analysis, and reporting of results. Not only does this provide students with introductions to other interdisciplinary students, it is a means by which junior faculty may be introduced to supervision of an interdisciplinary dissertation. It can also serve as a forum for student research presentations, as well as a means to bring in community members and researchers external to the university. Such interactions can assist students with networking and subsequent career goals.

Recommendation #5: In less structured programs, conduct a review of the course requirements for students over the past 5-6 years to ensure overall requirements are consistent with university norms.

Rationale: Less structured programs may entail quite different requirements for interdisciplinary students. These generally flow from existing disciplinary requirements. In the interests of equity, it is important to review past requirements to ensure that all students are treated fairly.

Recommendation #6: Allow flexibility in the nature of the dissertation.

Rationale: Interdisciplinary approaches are evolving and, with them, dissertations may need to evolve in order to allow the fullest expression of the research undertaken by the student. Already, we see changes in the nature of the dissertation amongst disciplinary programs. Further changes, as yet unknown, may be needed to gain the full benefit of the interdisciplinary approach.

Academic and Non-Academic In-Program Support

Recommendation #7: Award dissertation fellowships.

Rationale: Funding is crucial to student well-being and ability to complete a doctoral program in a timely fashion. Funding is not guaranteed for more than 4 years and, in some cases, there is no guaranteed funding. Most interviewees noted that students typically take 5-6 years to complete the program. This should be recognized when awarding funding. Dissertation fellowships could be funded on a merit basis, if it is felt that they would encourage students to focus upon timely completion.

Recommendation #8: The Dean or Vice-Provost of Graduate Studies should be the university champion for interdisciplinary programs

Rationale: Given the pan-university nature of interdisciplinary programs, it is crucial to have broad recognition of and support by disciplinary faculties to uphold the importance of an interdisciplinary program. Generally, interdisciplinary programs do not have a "home" that provides them with resources and funding. The Dean/Vice-Provost should be the champion for these programs and act as a neutral third party whose interests align with the university's strategic goals, as a whole. To integrate better into a university, interdisciplinary programs need to be promoted from higher-level administration in order to ensure that the value associated with these programs is recognized. This might require ensuring that the appropriate institutional structures are put in place to help interdisciplinary programs succeed. For example, some form of permanent physical space to which students are attached was seen as necessary by all interviewees. If permanent physical space is hard to find, perhaps, some form of rotating space could be arranged. Given the diverse nature of institutional structures, these changes may look different from one university to the next. However, some form of central hub to ensure that both authority and responsibility are aligned is consistent with ensuring continued program excellence. This can also ensure the development of a strategy to create a community of some sort for students in an interdisciplinary program to connect with one another and with colleagues outside of the interdisciplinary program. Interdisciplinary students often express isolation, and the lack of a sense of belonging, since they exist in their own silos of research.

Recommendation #9: Develop supports that are unique or tailor-made to fit interdisciplinary programs and ensure that students are made aware of the full range of support available to them.

Rationale: Regular communication and administrative outreach around expectations, deadlines, and milestones, as well as the provision of well-being and professional development support is crucial. These needs are felt by all doctoral students but are particularly acute for interdisciplinary students who are not part of the typical disciplinary cohort-support model. Often students do not realize that university-wide

programs are available to them and this information needs to be communicated in an accessible way.

Supervisor Relationship

Recommendation #10: Develop a mentorship model to encourage participation of new faculty (either junior or from different faculties) in interdisciplinary supervisions.

Rationale: Several interviewees noted the importance of a group of dedicated participants in interdisciplinary supervisions. This contributes to program excellence by ensuring that the best mix of supervisors is able and willing to contribute to student supervision. However, to ensure renewal of this core group, it is necessary to ensure that junior faculty, in particular, do not find the transaction costs of participation prohibitively high. Introducing a mentorship model that recognizes both the contributions of mentors and the challenges to mentees would help to normalize the role of interdisciplinary programs within the University. This is where a Dean of Vice-Provost might be able to work with Faculty Deans to recognize both teaching and supervision of students who are not enrolled in their Faculties. This might also include working with colleagues outside the university community to find external supervisors best placed to assist in the development of the research.

Post-Graduate Support

Recommendation #11: Clearly articulate competencies and skills obtained from participating in an interdisciplinary program.

Rationale: None of the programs have dedicated resources towards the development of interdisciplinary-specific forms of post-graduate support. In most cases, however, students are developing unique competencies and skills that are very marketable. Assisting students to articulate skills, particularly, the non-academic ones can help them with career decisions and lead to a smoother transition to the job market. Working with non-academic networks to design and deliver a program that identifies these skills and puts them into context would benefit all. Requiring them to begin working on an Individual Development Plan at the onset of their program is a good start. It can be used to help the translation of experiences into skills and competencies. The Individual Development Plan should then be revisited with not only the supervisory committee on a regular basis but also with career counsellors that may be more aware of interdisciplinary job opportunities.

Webinar Feedback

Webinar participants were generally in support of the findings and recommendations from the study. They were particularly interested in recommendation # 12, which called for a national resource on interdisciplinary programs to be created and made accessible

for researchers, program developers, students, and other stakeholders. A 13th recommendation was also added (coming out of the webinar) to the initial twelve (12) from the preliminary draft report. This recommendation was inspired by the near unanimous call from webinar participants for the creation of an interdisciplinary network, *inter alia* for the sharing of best practices. Participants also suggested that the hallmark of an excellent interdisciplinary program was one in which there was not too much structure (which could inhibit innovation in research), rather sufficient structure that creates space for student and faculty creativity and innovation. Effective communication with prospective and existing students (throughout the lifecycle of their programs) was also thought to be another hallmark of an excellent interdisciplinary program. This communication component was believed to be particularly key for these programs because of the challenges of isolation that students typically experience in these programs, which has been widely studied in the literature. It was felt that an excellent interdisciplinary program should also include collaborations between ID students and other non-academic departments on campus, particularly those research departments that are already engaged in collaborative research. Such initiatives would be beneficial to the students' development and career path and assist them in solving major real-world problems.

Participants suggested that all structures within the traditional system needed to support and champion interdisciplinary programs on campus. Another feedback was that, given challenges experienced in these programs (including traditional funding model and mentorship challenges), they should be administered by the innovation and research arms of institutions rather than typically being part of the graduate studies unit. Additionally, participants suggested that institutions showcase the accomplishments of their interdisciplinary students to encourage, inspire, and motivate potential and existing students. Finally, participants thought that building a culture of support for these programs will seamlessly enable the championing of interdisciplinary programs and research on campus. This culture of support would include incentivizing departments, innovation, and faculty members' participation as mentors etc. of interdisciplinary students, addressing the challenges posed by the traditional structure of non-interdisciplinary PhD programs, creating the narrative around the value of interdisciplinary programs at all levels of the system, and providing greater student support (funding, effective communication, mental health support, and skill development).

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Appendices

Appendix 1
Email to Prospective Interviewees

I am a member of the CAGS (Canadian Association of Graduate Studies) Task Force on Excellence in Doctoral Programs. My specific focus is on interdisciplinary PhD programs. Kenisha Blair-Walcott, a Doctoral student at the University of Saskatchewan and I have developed a framework for understanding benefits/challenges in interdisciplinary programs. We have identified a series of questions that we would like to ask a number of colleagues across Canada who are involved with such programs. We have identified the {Program at your university} to be of great interest to us. We are hoping that you would be willing to help us with this work by meeting with us for a one hour (max) virtual meeting within the next three-four weeks. We would be very grateful for your time and expertise. If you are willing, we will send you a copy of our framework to assist you in organizing your thoughts, along with the questions to which we are seeking answers.

Appendix 2
Framework Document Sent to Interviewees

Interview Questions: CAGS Excellence in ID Programs

Structure & Lifecycle

We are hoping that you are able to structure your comments around a lifecycle approach to the ID Doctoral program structure. We have included some suggested areas in which we are seeking detail but also want to hear your thoughts on other items that we don't mention:

Graduate Lifecycle	Responses
Recruitment/Marketing (e.g., clarity of expectations regarding program requirements)	
Admissions (e.g., who is responsible for making decisions)	
Post-Admissions Administration (e.g., nature of relationship between Faculty of Graduate Studies and program/department/centre/institute regarding rules)	
Course Program Structure (e.g., required courses, elective courses, comprehensive exams, proposal, dissertation, defence)	
In Program Support (e.g., both academic such as Library, IT, Ethics, etc) and non-academic (professional development, mental health, office space)	
Supervisor Relationship (e.g., are co-supervisors common?)	
Post-Graduate Support (e.g., networking, reference letters, post-docs, career counseling)	

1. How does the traditional structure of your institution support or impede the success of your ID doctoral programs?
2. Describe the challenges that students and administration face in your ID programs?

Curriculum

3. Are your ID curricula purposefully and systematically built towards interdisciplinarity (to achieve stated goals) or are they loosely put together? (You may answer this question in reference to the actual programmatic structure including course selection, comprehensive exams, proposal, and dissertation defence etc.)
4. How do you deal with differences in departmental or disciplinary expectations?
5. Dissertation scope: Are defensible boundaries around the research enquiry clearly stated and agreed upon by all parties?
6. Are any professional development skills explicitly included in your ID programs? If yes, how are they delivered?
7. Please describe your co-supervisor model, if one exists?

Student Support & Student Wellbeing

8. What is the extent of institutional support both for financing a doctoral student's progress, as well as for ensuring systems (including both academic and non-academic) are in place to facilitate student success?
9. What supports are in place to support student well-being in areas such as office space, contact with peers, mental and physical health, career planning, and time management skills?

Recommendations

10. Based on the experience of your ID program, what recommendations would you make to another institution desiring to develop an ID program?

Appendix 3: Data From Interviews

Table A-3 1. Demographic Data

Brock
- PhD in Interdisciplinary Humanities, located within the Faculty of Humanities

Concordia
- Individualized Program PhD, located within the School of Graduate Studies
- Interdisciplinary Humanities PhD, located within the Centre for Interdisciplinary Studies in Society and Culture

Dalhousie
- Interdisciplinary PhD, located within the Faculty of Graduate Studies

University of Alberta
- Individual Interdisciplinary PhD, jointly administered by the Faculty of Graduate Studies and Research, and individual home departments

University of British Columbia
- Doctor of Philosophy in Interdisciplinary Studies, located within Graduate and Postdoctoral Studies

University of Saskatchewan
- Individual Interdisciplinary PhD, located within the College of Graduate and Postdoctoral Studies

Institution	# Applied in 2021	# Accepted in 2021	Total # Enrolled in 2021	Average Years to Completion	Years of Program Existence
Brock	7	5	20	5-6	13
Concordia	INDI (MA PhD) PhD HUMA (Not Just ID) 45	20 18	160 136	6 5-7	30
Dalhousie	40	10	53	5-6	37
University of Alberta	10	7	50	4-6	20
University of British Columbia	27	9	80	4-6	50
University of Saskatchewan	16	5	12	5-8	26

Table A3-2. Lifecycle: Marketing/Recruitment

Institution	Marketing/Recruitment
BROCK	PhD in Interdisciplinary Humanities (housed in Faculty of Humanities). · Marketed alongside other programs by Graduate Studies. · Faculty members recruit with some recruitment from non-interdisciplinary programs. Clear expectations and program details on website.
CONCORDIA	Interdisciplinary Studies (INDI) provides MA and PhD options within a <u>Faculty</u> or across Faculties. · No specific formal marketing. · Some recruitment comes from existing students already within university (have a Masters' program). · Need to have well-defined project and students must secure committee members. PhD in Humanities offers degrees in Interdisciplinary Studies in Society and Culture (as a separate ID program offering). · Wanting to increase participation in University Open House. · Plan to initiate application workshop for prospective candidates. · Attracts mature students post fine-arts career, particularly given the program's support for and strength in research-creation projects. Clear details on website.
DALHOUSIE	Interdisciplinary PhD · All marketing handled by Graduate <u>Studies;</u> Director assists in recruitment · Mature students with a few from other disciplinary <u>Masters</u> programs. Clear expectations and description on website.
UNIVERSITY OF ALBERTA	Individualized Interdisciplinary Program (administered by Graduate Studies) · No explicit marketing. · Proposal form on website is very detailed and clear in expectations. · Students can apply retroactively after admission to disciplinary program. University has other programs (Neuroscience, Civil/Environmental Engineering, Religious Studies)
UNIVERSITY OF BRITISH COLUMBIA	Oldest Interdisciplinary Studies program in Canada, housed in Graduate Studies. · No explicit marketing since is a popular program (factors that attract students: openness, freedom to build individual program, communication and engagement, sense of connectedness) · Well-laid out website that is linked to Graduate Studies with clear expectations. Additional interdisciplinary programs (Genetics, Occupational Hygiene, Resource Management and Environmental Studies, Gender, Race, Sexuality and Social Justice; Biomedical Engineering; Interdisciplinary Oncology; Atmospheric Science, Bioinformatics)
UNIVERSITY OF SASKATCHEWAN	Individual Interdisciplinary Doctoral Program, housed in Graduate and Studies · No explicit <u>marketing;</u> Some recruitment of existing students (have masters' program). Some other interdisciplinary programs exist (e.g., Environment and Sustainability).

Table A3-3. Lifecycle: Admissions

Institution	Admissions
BROCK	Program has Director and Graduate Program Committee (drawn from core faculty members). · Students apply to Graduate Studies and are admitted to Graduate Studies. · Graduate Program Committee makes decisions and sends to Dean of Graduate Studies for final approval. · Application requires justification of interdisciplinary research.
CONCORDIA	The Individualized program has Director and program committee (total of 7 on committee; other members are drawn from across the university). PhD HUMA has a Graduate Program Director and admissions committee drawn from the combined CISSC/Humanities Board (Faculty in Arts and Science and Faculty of Fine Arts) · Students apply directly to each program.
DALHOUSIE	Program has Director and Admissions Committee. · Director reviews applications for minimum criteria. · Requires Statement of Interdisciplinary Research (SIRI) with each committee member writing a letter supporting the proposal. · Committee recommends admission; Graduate Studies makes final admissions decision.
UNIVERSITY OF ALBERTA	Individualized Interdisciplinary Graduate Program · Students required to complete Individualized Interdisciplinary Proposal form. · Student must seek out supervisors (no more than 2 different departments). · Individual departments review applications, and each must approve and admit the student. Other interdisciplinary programs · Follow the guidelines for each program, which differ by department/faculty.
UNIVERSITY OF BRITISH COLUMBIA	Students apply directly to Advisory Committee for Interdisciplinary Studies (membership represents different disciplines). · Program Chair recommends admissions to Graduate Studies. · Statement of Proposed Research Topic requires justification of interdisciplinary research and requires supporting assessment and agreement letters from 2 co-supervisors. · Students must secure approval to supervise from individual faculty members.
UNIVERSITY OF SASKATCHEWAN	Graduate Studies has a standing Interdisciplinary Studies Committee. · 2 co-chairs and 10 members, including some *ex officio* (e.g., representative from the Graduate Students Association). · Students apply directly to the Committee. · Application success is based on a picture of interdisciplinarity and proposed committee composition. Committee members must be identified at the application stage.

Table A3-4. Lifecycle: Post-Admissions Administration

Institution	Post-Admissions Administration
BROCK	Director does day-to-day administration with some administrative support. Core faculty members serve three terms and must apply for renewal. · Members currently come from Humanities, Social Sciences and Education Graduate Studies deals with exceptions and oversees codes and policies. Associate Dean (Humanities) may act as mediator.
CONCORDIA	INDI program committee does administration for INDI students and for programs that do not have a PhD program (e.g., Linguistics and most Fine Arts departments). · INDI Director keeps in constant touch with students; builds relationships and has an open-door policy. For example, during COVID, she held weekly mediated writing sessions. PhD HUMA has a Graduate Program Director and Graduate Program Committee who oversee admissions. · Committee members are drawn from Centre for Interdisciplinary Studies in Society and Culture (CISSC) board. For both programs, Graduate Studies oversees and arbitrates disputes; deals with exceptions and oversees codes and policies (e.g., scope of dissertation).
DALHOUSIE	Graduate Studies regulations govern all programs. No permanent staff position; no dedicated space for Director or to meet students. Graduate Studies staff help with administration and recognize the program as one of their own. Director and Assistant do most "departmental level" administration for the program, including monitoring progress, maintaining individual and group contact; Director takes lead in resolving challenges. Director advises incoming students to hold discussions with supervisors and committee at the outset of a program to discuss scope and disciplinary expectations. Advice to committees is being added to website.
UNIVERSITY OF ALBERTA	Regulations are program- and Faculty-specific. Vice Dean in Graduate Studies may review and negotiate when there are conflicts or to ensure that students are not doing two degrees. Individual department do their own administration.
UNIVERSITY OF BRITISH COLUMBIA	Interdisciplinary Studies is the only program in Graduate Studies. Program Chair (with a reduced teaching load) has a full-time administrator and an assistant. Students are encouraged to reach out to the Program Chair and administrators for support first, so they can be directed to appropriate university resources. Graduate Studies may be called in to negotiate if there is a clash over comprehensives (but they have very little veto power).
UNIVERSITY OF SASKATCHEWAN	Graduate Studies has administrative staff who administer the Interdisciplinary Program.

Table A3-5. Lifecycle: Course Program Structure

Institution	Course Program Structure
BROCK	Systematically built program · 6 half-credit courses (2 compulsory). Language exam (other than English). · Compulsory non-credit research and professionalization seminars. · 2 written and 1 oral comprehensive exams (each having a separate committee). · Student participates in submitting reading lists for written exams but program has some standard reading lists and a share of items on these must be included. · Capstone proposal, project and defence.
CONCORDIA	INDI · No specific curriculum · Students need to select 6 courses PHD HUMA (Targeted and systematically built program) · 2 required core seminar courses for all (explain what must be learned from a particular topic and disciplinary orientation); 4 more courses from other disciplines · Comprehensives in 3 fields (each supervisor); students help develop curriculum; if doing a research creation project, one comprehensive is a studio comprehensive · Proposal, thesis and defence (Scope of dissertation can create disagreements)
DALHOUSIE	Minimum 4 courses (2 can be directed studies) but no specified required courses. Comprehensive examination committee determines the nature of the exam, following general Graduate Studies and Program guidelines. Proposal, format can be determined by supervisory committee. Dissertation and defence; tight guidelines to ensure fair and transparent processes. Substantial amount of tailoring of the program to the student's specific needs (e.g., cultural) Defence process is being modified to be culturally respectful.
UNIVERSITY OF ALBERTA	Decentralized structure, minimum number of courses is program dependent and variable University rules on what constitutes a dissertation. Professional development skills are required for all graduate students (not just Interdisciplinary Doctoral students) with 8 hours of professional development and requirement to produce an Individual Development Plan.
UNIVERSITY OF BRITISH COLUMBIA	No required courses or course load. No specific curriculum or structure. Student can create own curriculum with committee. Student and supervisor are asked to provide lists of courses taken. Comprehensives, proposal, and dissertation are required.
UNIVERSITY OF SASKATCHEWAN	All students must take a seminar series course. Variation in terms of disciplinary differences and scope.

Table A3-6. Lifecycle: Academic and Non-Academic In Program Support

Institution	Academic and Non-Academic In Program Support
BROCK	Faculty of Graduate Studies provides fellowships for 4 years: $13K domestic and $23.K international; few TAships since no undergraduate interdisciplinary program. Program courses considered part of faculty teaching load. University has generic TA and graduate skills program for all students. Student office space generally associated with TAship.
CONCORDIA	Well-funded for 4 years from Graduate Studies (normal time to completion is 5 years) University has generic graduate skills program for all students Generous leave policy for all students (up to 6 leaves without questions) INDI · Director and staff in constant touch with students; provide defence checklists and office provides extensive help to make sure all tasks are completed · Student advising is a major part of the unit; Supervisor responsible for providing office space PhD HUMA · Program has little formal support since it falls between two faculties (unequal resources) and has no own faculty members (no dedicated TAships) · Graduate Program Director and Committee offer advice, support, counselling on academic matters and act as pointer to university resources for non-academic matters · Funding beyond that provided by Graduate Studies depends on primary supervisor's Faculty · Started orientation and planning a library/research workshop
DALHOUSIE	Students must demonstrate having at least 2 years of required funding committed; may come from variety of sources but not Graduate Studies Graduate Studies gives some funding to program (grades based) and some funding to support students from years 3 to 6 on the basis of need alone No dedicated office space; depends upon supervisor Generic professional development program and mental health supports for all graduate students Director created program to train graduate students in public outreach and students are encouraged to participate in the OpenThink program
UNIVERSITY OF ALBERTA	No minimal funding level but some programs won't take a student who is unfunded; no Graduate Studies funding is available and physical space is responsibility of home department.
UNIVERSITY OF BRITISH COLUMBIA	Minimum funding of $22K per year must be provided by faculty for 4 years or for applicants who are ranked high enough to receive one of four ISGP funding packages (but no funding is available beyond 4th year – usually poses a problem for PhD students). Specific space on campus too small for all; small amount of desk space available Encourage departments to recognize faculty working with IDP students (little to no recognition for supervising an IDP student outside one's faculty area). No explicit mental health program for graduate students.
UNIVERSITY OF SASKATCHEWAN	Budget process hampers funding (no guarantee of minimal funding and some students have no funding) Colleges have different rules, and some won't admit students without funding Can apply to Dean FGS for funding of programs

Table A3-7. Lifecycle: Supervisors and Committees

Institution	Supervisors and Committees
BROCK	Thesis supervisor and 2 other committee members (drawn from Core Faculty). Can have co-supervisor Teaching is recognized as part of load
CONCORDIA	INDI · 3 person committee with 1 lead supervisor is typical; can be drawn from across the university; Possibility for co-supervisors HUMA PhD · 3 person committee with 1 lead supervisor and 2 advisors is general pattern · Insist on primary supervisor because of funding issues · Co-supervisor model is rare, except in circumstances where an outside supervisor is needed, then an internal co-supervisor needs to be identified
DALHOUSIE	Co-supervisory model exists (supervisor/s can be external but at least 1 needs to be internal) Faculty members must be part of the Department of Graduate Studies to supervise. Usually have a core supervisor though because of disciplinary boundaries Challenges can arise when committee members come from different disciplines (rare)
UNIVERSITY OF ALBERTA	Can have 1 or 2 supervisors (but need home supervisor and home department) Much autonomy Deans recognize supervision of students in another faculty No formal mentoring of junior faculty in interdisciplinary methods or supervision
UNIVERSITY OF BRITISH COLUMBIA	Usually 2 co-supervisors and after comprehensives, a third is added, with 1 person most involved 50% of committee can be external (members are recruited both for their expertise and if there are inter-committee member problems) Explicit mechanism to work with supervisors and students when relationship breaks down: 1) documentation required from both parties; 2. Ask about what was discussed and annual progress report (2 levels of reporting) Supervisors often set disciplinary-expectations for student; more meta-interdisciplinary expectations are needed Human Resources now recognizes work load to include teaching of interdisciplinary courses) but some Faculty Deans have been slow to recognize. Junior faculty are actively engaged and interested in being involved in ID programs, helps to build up resumes.
UNIVERSITY OF SASKATCHEWAN	Generally single supervisor model Currently, only 3 students have co-supervisors (1 of which is external to the university) Main support typically comes from supervisor

Table A3-8. Lifecycle: Post-Graduate Support

Institution	Post-Graduate Support
BROCK	Rely on supervisor and committee to provide advice and letters
CONCORDIA	INDI · rely on supervisor and committee to provide advice and letters HUMA PhD · rely on supervisor and committee to provide advice and letters · Many students pursue the degree to further an existing career and are more mature and in full time employment.
DALHOUSIE	Career advice is general and given at entry Supervisors often write reference letters but sometimes Director can also be called upon to write a letter. Graduate Professional Development program offers skills training to all graduate students.
UNIVERSITY OF ALBERTA	Rely on supervisor and committee to provide advice and letters Require students to complete and Individual Development Plan
UNIVERSITY OF BRITISH COLUMBIA	Strong alumni tradition is lacking; alumni office connections are not part of the UBC culture. Program Chair encourages students at the comprehensive level to think of a 5-year plan, e.g., where do they want to go and what do they want to do? Need mindset shift for post-graduation support for interdisciplinary students at the university level.
UNIVERSITY OF SASKATCHEWAN	Encourage students to take professional skills certificates. Good alumni network in general but nothing specific for Interdisciplinary Graduate Students.

Table A3-9. Additional Comments/Challenges/Observations/Recommendations

Institution	Comments/Challenges/Observations/Recommendations
BROCK	Students must understand what interdisciplinarity means and what appropriate research methods are. Administrative challenges when faculty are not formally affiliated (e.g., willing administrators, sufficient courses mounted, recognize faculty contributions). Program oversight is crucial to ensure consistency in program requirements. Clearly articulate competences and skills obtained from participating in an interdisciplinary program. Identify degree outcomes and expectations.
CONCORDIA	HUMA PhD Critical to consider program's 'home' or physical space. Consider culture – what academic life will surround program e.g. community was an important part of the culture at Centre Program support e.g. context, space, resources, open-ended, freedom (create right conditions). Students should have a leading role.
DALHOUSIE	More online meetings to bring students together 'No home' – need a place to work - major challenge for ID students Clearer guidance needed in dealing with conflicts. (Current guidance is too broad)
UNIVERSITY OF ALBERTA	Institutional impediments due to boundaries established around programs for administrative reasons (some of which are artificial). Institution can provide a foundation and structure for interdisciplinary programs but there is confusion around the definition of interdisciplinarity. This it difficult to define the program is and creates challenges for institutional hiring of students with these degrees (hard to see what the fit is). If interdisciplinarity is a university strategic goal, metrics are needed to measure progress. Need to shift the culture around how people think about interdisciplinarity on all levels Program needs to be attractive and flexible but not intimidating Need to promote interdisciplinarity from the top of the institution as something that is valuable
UNIVERSITY OF BRITISH COLUMBIA	Confusion around what interdisciplinarity means. Faculty feel pressure to focus on their own discipline
UNIVERSITY OF SASKATCHEWAN	Greater support needed of program and students (treated as additional role for Graduate Studies) Funding a challenge for students Program needs a home (departmental structure and administrative support) to allow it to secure needed resources Program needs physical space for students, similar to other disciplinary programs Programs extremely diffuse in space and time (pandemic has created a similar diffusion for other disciplinary programs) Typical time to completion is 5 to 6 years, even going to 8 years