

Perspectives

A Doctoral Student Complementarity Approach (DSCA) for Global Health Research

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A large and growing number of doctoral students are involved with global health research. Here we outline the Doctoral Student Complementary Approach (DSCA), a strategy to connect doctoral students from high-income countries (HICs) with counterparts from low-income countries (LMICs) in order to incur benefits for both students and improve the quality of global health research. In addition to presenting a description of the DSCA, we discuss its alignment with the Core Competencies for Global Health Research and Practice and some key barriers, challenges and opportunities related to its implementation. Although this presentation of the DSCA is an entry-point to new possibilities for doctoral students, the approach will benefit from further refinement through feedback. We therefore call upon our colleagues, especially those in LMICs, to provide input regarding the opportunities and challenges of a DSCA in practice.

Introduction

Students from a variety of disciplines, institutions, educational backgrounds, geographic regions and cultures are being increasingly drawn to the field of global health. Among this diverse group of students are those enrolled in academic institutions in high-income countries (HICs) who have lived, worked, volunteered, conducted research in or travelled to low and middle-income countries (LMICs). Most of these students have been impacted by the experience of extreme global inequality and see themselves as playing some role in addressing these deep-rooted disparities in health determinants and outcomes.

We are writing this paper as two such global health students, both completing research-intensive doctoral degrees. We are Canadian citizens and based at the University of Toronto. Shaun Cleaver is conducting disability and rehabilitation PhD research in Zambia; Nadia Fazal is conducting peace and health PhD research in the Democratic Republic of the Congo.

While we understand the elusiveness of working towards sustainable change in global health, and the ease with which one can contribute to unintended consequences, we are confident that PhD students (and students in general) have a critical role to play in obtaining tangible and positive change on a local and global scale.

From this standpoint, we acknowledge that we have particular values and principles underlying our drive to pursue global health research. Additionally, we recognize the importance of articulating these values in order to ensure their application within our independent doctoral research studies. For these reasons, we have worked collaboratively to conceive an approach that we present here: A Doctoral Student Complementarity Approach (DSCA). We are proposing this approach because we see an important gap in what we have come to know and understand about the field of global health (see “our understanding of global health” below): while it is relatively straightforward and acceptable for us to travel from our high-income country to conduct research in low-income countries, it is not typically encouraged or required for us to connect and collaborate with students from the low-income countries we visit. We propose an explicitly named approach to that gap in order to emphasize the specific aspects of this idea that we are developing and refining. While this approach is focused at the level of the individual

student, we foresee that it could ultimately facilitate partnerships between academic institutions and global health doctoral programs.

In presenting this approach, we are cognizant that we are doing so from our perspective as Canadian doctoral students conducting research in low-income countries: indeed, our positionality limits us in this way.¹ As such, the DSCA currently lacks the critical perspective of our specific colleagues in our countries of research, and from doctoral students in LMICs in general. Nonetheless, we have conceived this idea with a consideration of what we observe and understand our colleagues’ needs to be, and we hope that this paper will initiate a discussion that attracts and engages these important stakeholders in the further development, revision and conceptualization of a more robust DSCA.

In this paper, we discuss global health as a field and our roles in it, to identify some important obstacles that need to be addressed in global health doctoral research. We then introduce the DSCA, by discussing its alignment with the Core Competencies in Global Health Practice and Research, before launching into the specifics of how this approach could be operationalized and the “intermediary outcomes” that may result from its implementation. Finally, we discuss foreseeable barriers, key opportunities and challenges to consider as we—and other doctoral students or doctoral programs—seek to practically apply a DSCA.

Global Health and Our Role as Doctoral Students *Our Understanding of Global Health*

Global health—distinct from international health, public health and tropical medicine—has been defined in a number of ways in the related literature (namely: Koplan et al.³ and Kickbush⁴). We recognize that the concept of global health research was developed in high-income countries and is a term most popular in North America and Europe. A given research project in a low- or middle-income country would likely be referred to as “health research” by a researcher from that country, while the very same project would be considered “global health research” by a visiting researcher from a high-income country. For the purposes of this paper, we will adopt Beaglehole and Bonita’s definition of global health research as “collaborative transnational research and action for promoting health for all.”⁵ This definition highlights four key aspects that we believe to be

critical in global health: collaboration, health equity, global health's transnational nature and global health's inextricable relationship with research and action.

Two frameworks that have been fundamental to our understanding and conceptualization of global health and global health research are the "political economy of health framework" and Bozorgmehr's "concept of global health."^{6,7} Important in each of these frameworks is their emphasis on multi-level and multi-sectoral determinants of health. These determinants of health include considerations of the global political and economic context such as global governance structures, global markets, global communication and diffusion of information, global mobility, cross-cultural interaction, global environmental change, macro-economic policies, trade agreements and flows, intermediary global public goods and official development and debt relief. In addition, these determinants of health include those at national, organizational, workplace, community, household and individual levels.^{6,7}

We have an understanding that global health research is grounded in values such as: health equity, social justice, health as a human right and a sensitivity to the history of international health.^{8,9} Additionally, we are committed to the Core Competencies in Global Health Practice and Research.² Throughout this paper, we are guided by these foundational frameworks, concepts, definitions and values of global health as we seek to position ourselves within this field and to define our role within it.

Our Role as Global Health Doctoral Students

Given the many layers of political, economic, cultural and social factors that influence global health, we see our role as global health doctoral students as multi-dimensional: through our independent research dissertations, we aim to understand broader structural-level change to existing international and national bodies, while also aiming to impact 'on-the-ground' changes at the individual, household, community, workplace and organizational levels. As "hopeful realists," we acknowledge the many obstacles and challenges in obtaining global health goals, but are committed to moving forward in a positive direction toward affecting change on an international scale that we believe to be ethically imperative.⁶

Obstacles in Global Health Doctoral Research

There are many obstacles that prevent doctoral students globally from conducting useful, practical, ethical, culturally-relevant and sustainable global health research. For example, doctoral students from HICs conducting research in LMICs may lack a critical contextual and cultural understanding of the region where they are conducting their research. Additionally, due to structural factors in LMICs, there may be limited access to courses that address substantive and methodological developments. Further obstacles may include unequal access to resources for students in LMICs relative to students in HICs; inadequate funding opportunities; high tuition costs; short timeframes for "overseas" research data collection; language barriers; cultural differences;⁹ lack of sustainable partnerships between LMIC and HIC academic institutions and graduate students;¹⁰ and unequal publishing opportunities for students in LMICs relative to those in HICs.

A Doctoral Student Complementarity Approach (DSCA):
Aligning with Core Competencies of Global Health Research

and Practice

A Doctoral Student Complementarity Approach

Bearing in mind the obstacles in global health doctoral research, we propose the idea of a Doctoral Student Complementarity Approach. We refer to "complementarity" in this paper—defined as "a complementary relationship or situation"—as a synergistic process, whereby the coupling of complementary entities leads to a combined product of greater value than the sum of its individual entities.¹¹ By "coupling," we are referring to an academic connection between two doctoral students that could be formal or informal. The coupling is voluntary, intentional and actively recognized by both students. When coupling is applied to the idea of doctoral students embarking upon global health research, we see this term as the process of coupling a doctoral student enrolled in an institution in a HIC with a student enrolled in an institution in a LMIC. For the purposes of a DSCA, the student from the LMIC should be living in, be studying in and be a national from the country where the doctoral student from the HIC plans to conduct their dissertation research. This coupling can be initiated by the students themselves and should benefit each of the students in their pursuits to produce research with both scientific rigor and maximum contextual relevance.

A DSCA implies an explicit and intentional dialogue between the two students. Since the students may be separated by distance for a large part of their programs, this dialogue will undoubtedly require communication technology such as email, telephone, social media and voice over Internet telephony (i.e. Skype). The specifics of the DSCA will depend greatly on the individual needs and priorities of the participating students as well as other external factors. Regardless, the essence of this approach is that the intentional exchange between them has the potential to change the perspectives of each and ultimately improve the overall quality of their independent research. Inevitably, a DSCA

requires that both students share some common ground; their connection on this common ground must satisfy the respective interests that make the relationship meaningful to each.

Alignment with Core Competencies

In proposing the idea of a complementarity approach, we understand it to be fundamentally aligned with Core Competencies in Global Health Practice and Research.² In 2010, a diverse group of Canadian global public health stakeholders assembled to discuss the development of competencies applicable to global health research and practice² as extended from the Core Competencies for Public Health in Canada.¹² Through this process, the group developed 25 competencies that are applicable to global health research or practice.² Although we see all of these competencies as important, we have identified four groupings that are relevant to our discussion of a DSCA, identifying each of these groupings by one particular competency and incorporating other core competencies within the group. These groupings are a) knowledge relevance to users, b) identifying and collaborating with colleagues of different backgrounds, c) respect of cultural diversity and d) self-reflection on one's own social location. Each of these, and their relationship to complementarity, will be discussed here.

a) Knowledge relevance to users. Doctoral student complementarity can create a shared space to better identify possible users of research. In turn, this could lead to projects that are designed to best meet these constituencies' needs. This principle is particularly

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poignant for student researchers from HICs conducting research in LMICs where they are likely to be less familiar with the context, and stand to develop far more contextually relevant projects with the insight of a colleague from that nation.¹³ At the same time, however, the relevance of research conducted by LMIC doctoral students in their own country could also be improved through a DSCA as local student researchers exchange ideas and perspectives with counterparts from HICs in order to improve the research conducted in their local setting.¹⁴ Through this exchange the doctoral students from LMICs could benefit from this ongoing research-specific dialogue. Furthermore, students from LMICs could tap into additional resources, to which students from HICs might have access, for theoretical or methodological purposes.

Intrinsically tied to the issue of relevance are the mechanisms through which global health research fulfills its purpose of “being translated into solutions that address real-world problems.”¹⁹ These mechanisms are reflected in the competencies, addressing the need for research results to inform advocacy activities, as well as “community action, program management and policy-making.”²² Moreover, these issues are best addressed when incorporated into the research plans with consideration of how the knowledge discovered (or created) is then put into use. Through complementary relationships, doctoral students are thus able to inspire and challenge each other to develop and conduct research that effectively achieves change through its intended actions, as is demanded by the Core Competencies in Global Health Practice and Research.²

b) Identifying and collaborating with colleagues of different backgrounds (i.e., cultural and disciplinary). The key principle of complementarity is connection between doctoral students from different countries, a principle that almost automatically satisfies the demand that researchers reach out to colleagues from different cultures. It should be noted, however, that among scholars the most relevant strands of “culture” may not be ethnically, linguistically or nationally based: in discussing an established and successful partnership between Canadian and Burkinabe researchers, Ridde et al.¹⁵ note that cultural clashes due to academic discipline were more challenging to manage than those of national origin. This finding further supports the prerogative that stimulating collaborations should be transdisciplinary as well as transnational.¹⁶

An additional two proposed competencies are related to communication and dialogue across cultures, disciplines and jurisdictions. Consistent with these competencies, a complementary relationship requires that doctoral students engage in communication with others from different backgrounds, an exercise that allows the doctoral students to better appreciate other styles of communication and improve their own proficiency in communicating in these styles at an important stage in their skills development. This learning through practice can also be supplemented by the insight of doctoral students of different backgrounds in suggesting communication strategies that are more likely to resonate with important audiences that foreign doctoral student researchers may be less likely to connect with independently.

c) Respect of cultural diversity. A DSCA can encourage the recognition and incorporation of multiple cultural views through its processes of linking doctoral students from different cultural backgrounds. As this competency relates directly to global health research and interventions, a DSCA creates a forum between doctoral students to discuss their respective preferences and priorities and expose one another to the lenses of a colleague from a diverse cultural background.² In this process of exposing and sharing, the complementary doctoral students are in a position to better understand other cultures and further make their research contextually relevant.

d) Self-reflection on one’s own social location. Similar to its respect of diversity, a DSCA challenges one’s view by creating a relationship where parties are forced to come to terms with the different social locations of a colleague. By social location we are referring to the position that a person finds her/himself in relative to others. Social location is influenced by not only the identities that are claimed or ascribed to a person, such as age, gender, race, sexuality, nationality, etc., but also roles. One’s social location impacts their worldview and the opportunities available to them. It should be noted that the doctoral students could share similar positions in

some respects (that each is a well-educated student researcher in his/her respective country), but markedly different locations in other important ways. One important difference in a DSCA relationship could be due to access to economic resources or LMIC-HIC power dynamics. Nevertheless, social locations are the product of intersections, such that nationality is only one element of a social location. Furthermore, nationality is not deterministic: just because high-income countries are wealthier than low-income countries does not mean that all citizens in HICs are wealthier than citizens of LMICs. In fact, we have seen from our experiences that PhD students in LMICs typically fall in the higher socio-economic status bracket of their countries, whereas we have not observed this same phenomenon for PhD students in HICs. Nonetheless, when discussed with mutual respect and open communication, the contrasting elements of a colleague’s social location can provide doctoral students a lens through which to better understand that their social location is indeed merely one location among many and allow individuals to become more aware of how this location relates to that of others.

Envisioning a Doctoral Student Complementarity Approach

Given this understanding of how the proposed DSCA relates to the Core Competencies in Global Health Practice and Research, we present an overview of how this approach could be applied practically. Most doctoral programs follow a similar series of stages, including 1) Course selection; 2) Committee member selection; 3) Comprehensive examination; 4) Research proposal and study design; 5) Ethics proposal; 6) Data collection; 7) Data analysis; 8) Dissertation write-up and 9) Knowledge transfer/exchange. Although we recognize that there are variations to these stages and their order in individual doctoral programs, this prototypical series is useful to describe the relevance of the DSCA as the students move through their programs. Here, we first describe the relevance of the DSCA for each stage of a typical doctoral program, and in the following section we will identify the potential “intermediary outcomes” that can result from its application at each stage.

1) Coursework. While doctoral programs are designed to allow students to pursue independent research projects, some academic institutions may require doctoral students to complete courses before proceeding to engage in their own independent research.¹⁷ While some courses may be mandatory for the particular program of study, it is possible that students at this stage are able to choose among a selection of elective courses offered within their academic institution. A DSCA can influence course selection and involvement through the support and advice that each student offers the other.

2) Committee member selection. Doctoral students are often responsible for selecting their own dissertation committee members. Students may be influenced by a variety of factors when making these decisions. A DSCA can facilitate the selection of an international committee member for either student involved. Moreover, even if students do not seek international committee members, the perspective offered through a DSCA could influence the students’ selections of committee members in their own institutions.

3) Comprehensive examination. In some academic institutions, it is mandatory that doctoral students complete a comprehensive examination before engaging in their independent research study. The examination is typically either one (or more) invigilated written exam(s), or one (or more) paper(s) written independently by the student over a limited period of time. In some institutions, there is also an oral component where the student must orally defend the written component of his/her examination. Since comprehensive exams entail an extensive consideration of knowledge and ideas, the DSCA can motivate students to use the stimulation of this process in order to further develop ideas and co-publish.

4) Research proposal and study design. Every doctoral student needs to develop a specific research proposal outlining their precise study design. While some institutions ask for this to be completed upon the application of the graduate student for the doctoral program, others require the student to develop this proposal during the doctoral program itself. A DSCA can influence this stage of the doctoral research process in important ways, as the students involved conceptualize their research plans and consider their respective access to resources.

5) Ethics proposal. When conducting research with human participants, undergoing ethics review is a standard process in most countries and academic institutions. Sometimes, however, there is no robust or discipline-appropriate research ethics board (REB) in place and the ethical aspects of the research study may go unchallenged. This stated, even when there are strong and appropriate REBs, distance and a lack of familiarity with the board could complicate the submission process for students from abroad. Involvement with a DSCA can lead to more ethical research practices, logistically-facilitated REB submissions and the possibility of strengthening REB structures.

6) Data collection. Most doctoral students are required to collect data for their independent research studies. This stage is often an expectation of doctoral programs worldwide. A DSCA can lead to more access to resources and more rigorous research.

7) Data analysis. All doctoral students are required to analyze the data that they have collected for their independent research studies. Engaging in a DSCA can lead to important insight, access to resources and more rigorous research.

8) Dissertation write-up. Once the data analysis stage is complete, the doctoral student is required to write-up their findings in the format of a final thesis dissertation. Although the format and requirements for each of these final dissertations may vary, this stage is present in all doctoral programs worldwide. A DSCA can lead to better access to resources, increased research output and a higher level of rigor at this stage.

9) Knowledge transfer/exchange. It is critical that a doctoral student's research findings are shared with the relevant stakeholders of their particular research project. While this is listed as the final component of the doctoral process, we acknowledge that this stage is not always mandatory for doctoral students; additionally, we would argue that this stage should occur as an ongoing process throughout the entire research study. Through a DSCA it is possible for students to better connect with various types of audiences in the country of the research as well as international audiences.

The "Intermediary Outcomes" of a Doctoral Student Complementarity Approach

The ultimate intended outcome of a DSCA is global health research that is more useful, practical, ethical, culturally relevant and sustainable. "Intermediary outcomes" are positive changes that occur through a DSCA that are on the pathway to achieving the ultimate intended outcome(s). The "intermediary outcomes" that may result from implementing a DSCA at each of the doctoral program stages include contextualized thinking, institutional change, international learning, increased contextual relevance of research, increased access to resources; more rigorous research, co-publication, more ethically sound research practices, international sharing of research findings and reaching audiences outside the academic institution.

Many of the "intermediary outcomes" are asymmetrical in the sense that the benefits are more easily foreseen for either the student from the HIC or the student from the LMIC. In order to describe these benefits more specifically, we will refer to two hypothetical doctoral students who are coupled through a DSCA. Paul is a man studying at a university in a low-income country and completing his dissertation research in that same country. Laura is a woman studying at a university in a high-income country who is completing her research in Paul's country.

Contextualized thinking. Laura's increased understanding about her research context (as provided by the perspective of Paul) can influence Laura in her course selection (topic-, method- or theory-related), and the way in which the findings are understood and written up. This intermediary outcome is most applicable to Laura's research since she is less familiar with the context.

Institutional change. Either student has the opportunity to gain an increased understanding of the kinds of methods and theories that are being taught in relation to their research interests at another academic institution that is contextually very different from their own. With this broader outlook, either student can more actively seek out professors within their academic institution who are knowledgeable in these particular areas, and encourage them to offer graduate level courses in these areas if they are not already

being offered. Additionally, in cases where the research ethics board (REB) is weak or absent, dialogue between the students can help Paul or Laura challenge the professors and leaders within his or her academic institution to develop a rigorous research ethics board, or to strengthen the one that is currently in place.

International learning. There is potential for this approach to lead to some level of involvement for Paul, as well as his colleagues and professors, in Laura's courses, or vice versa. This involvement could be facilitated via interactive technological platforms such as Skype and include components such as virtual guest lectures and international student discussions.

Increased contextual relevance of research. For Laura, a committee member from Paul's academic institution could be extremely beneficial in guiding her doctoral process and ensuring that it is contextually relevant during all stages. As part of a DSCA, Paul could provide background information on faculty members in order to help Laura contact potential committee members that are of better fit and congruence to her plans. The stronger student-advisor relationship allowed by this better fit could further strengthen the contextual relevance.

Furthermore, through a DSCA, Laura's increased understanding about the regional context where she will be pursuing her research (from Paul) could dramatically shift the way in which this research proposal is written, the practical process of data collection (as contextually relevant obstacles of Laura's research could be flagged by Paul) and the ways in which the data is analyzed and written up.

Increased access to resources. For Paul, involving a committee member from Laura's academic institution could help to provide increased expertise, credibility and resources throughout his PhD program. Additionally, Laura may be able to share resources related to the theories, methods, topic area, data collection, data analysis and final write-up of Paul's research. These resources could influence the degree of rigor in Paul's research proposal. Although it is true that the improved access could also occur in the opposite direction (i.e. a committee member from Paul's institution providing increased expertise, credibility and resources to Laura, or Paul providing resources to Laura), we propose that this intermediary outcome will more often be of primary benefit to Paul. We see this asymmetry to be the product of a global structure where universities in HICs are better resourced and have better reputations than those in LMICs. This resource imbalance then leads to increased capacity and specialization in HIC universities, while the reputation imbalance leads to increased credibility. We recognize that this general pattern does not apply to every specific university in either HICs or LMICs, nor does it apply to every pair of students; there could be instances where the asymmetry operates in the reverse of the general pattern.

More rigorous research. For both Paul and Laura, involving a committee member from the other student's academic institution, who is a trained expert in the student's research area, could help to improve the overall level of rigor of the student's research study. Additionally, discussing and reflecting upon the benefits and challenges of their respective research projects through a DSCA could help to improve the overall level of rigor of both students' studies at the stages of research proposal and study design, data collection, data analysis and dissertation write-up.

Co-publication. A complementarity approach could lead to a co-publication between Paul and Laura. Given that both students will become "experts" on the content and findings of their respective doctoral dissertations, the differences and similarities between these dissertations will become increasingly apparent as both of the students progress within their respective programs. Via ongoing dialogue, it may be possible for these students to write and publish a paper together about the ways in which their research findings intersect. This could help provide the academic community with a broader perspective about the ways in which their independent research phenomena are connected in a broader context. Although we see this as a particularly plausible outcome at the "comprehensive examination stage" and the "dissertation write-up stage," the sharing of ideas leading to co-publication is really possible at any point in the DSCA students' collective journey.

More ethically sound research practices. Paul can offer Laura an increased understanding of what might be relevant to include

Doctoral Program Stage	'Intermediary Outcomes' of a DSCA	Potentially Desirable Characteristics of Students' or Relationship	Relation to Global Health Core Competencies ⁵
1. Coursework	Contextualized thinking	- Foresight about what courses could be most useful at an early stage in the program.	a, c, d
	Institutional change	- Willingness of both students to seek out and share resources. - An interest by either student to ask questions and challenge the material presented by the other student. - Perseverance and advocacy by the students to pursue change.	b, c
	International learning	- Planning, scheduling and technological skills in both students.	b
2. Committee member selection	Increased contextual relevance of research	- Paul has a good awareness of the faculty in the LMIC institution. - Diplomacy, strategy and perseverance of Laura to promote a dynamic in which the HIC institution, and its committee members, accept the status and expertise of the LMIC committee member.	a, b, c
	Increased access to resources	- Laura has a good awareness of faculty in her institution.	b
	More rigorous research	- Students have a good awareness of faculty in their institutions. - Students have access to knowledgeable and highly qualified professors within their respective academic institutions.	a, b, c
3. Comprehensive examination	Co-publication	- Creativity on the part of both students to see the areas of connection or divergence in their respective work. - Diligence and time to complete an extra-curricular initiative. - Clarity in communication and leadership on the part of both students in order to divide responsibilities and remain focused.	b
4. Research proposal and study design	Increased contextual relevance of research	- Uninhibited and flowing communication that allows Laura to share her plans, and Paul to critique these plans.	a, c, d
	Increased access to resources	- Paul is able to conceptualize what resources are needed. - Laura is resourceful.	b
	More rigorous research	- Students are able to be open and honest about the challenges and struggles that they are facing at this stage. - Students are able to be reflective and explicit about the perspective that they bring to their research proposal and study design.	a, b, c, d
5. Ethics proposal	More ethically sound research practices	- Paul is aware of community and institutional ethical norms and concerns. - Paul has sound understanding of local ethical principles and processes in order to best identify useful or harmful aspects of HIC ethics.	a, c, d
	Institutional change	- Students have a sound understanding of ethical principles and processes. - Perseverance and advocacy by the students to pursue change.	b
6. Data collection	Increased contextual relevance of research, more ethically sound research practices	- Paul has good awareness of data collection challenges.	a, c, d
	Increased access to resources	- Laura uses her resources efficiently and creatively to ensure that there are sufficient resources remaining to contribute to Paul's work.	b
	More rigorous research	- Students are able to be open and honest about the challenges and struggles that they are facing at this stage.	a, b, c, d
7. Data analysis	Increased contextual relevance of research	- Paul is indeed aware of and respectful of the context and culture of interest, which could potentially not be the case if Laura's research is conducted with a subaltern group while Paul is a member of a dominant group.	a, c, d
	Increased access to resources	- Laura uses her resources efficiently and creatively to ensure that there are sufficient resources remaining to contribute to Paul's work.	b
	More rigorous research	- Students are able to be open and honest about the challenges and struggles that they are facing at this stage.	a, b, c, d
8. Dissertation write-up	Contextualized thinking and more ethically sound research practices	- Paul has good awareness of the nuances and context relevant for Laura.	a, c, d
	Co-publication	- Creativity on the part of both students to see the areas of connection or divergence in their respective work. - Diligence and time to complete an extra-curricular initiative. - Clarity in communication and leadership on the part of both students in order to divide responsibilities and remain focused.	b
	Increased access to resources	- Laura uses her resources efficiently and creatively to ensure that there are sufficient resources remaining to contribute to Paul's work.	b
	More rigorous research	- Students are able to be open and honest about the challenges and struggles that they are facing at this stage.	a, b, c, d
9. Knowledge transfer/exchange	International sharing of research findings	- Collaboration and inter-cultural understanding on the part of both students to ensure that the presentations are relevant and clear to the audiences at the counterpart institutions.	a, b, c

Table 1: Connections between DSCA elements
The hypothetical students are Paul (a man from a LMIC) and Laura (a woman from a HIC) Global Health Core Competencies include: a) Knowledge relevance to users; b) Identifying and collaborating with colleagues of different backgrounds; c) Respect of cultural diversity; and d) Self-reflection on one's own social location.

in an ethics proposal for their specific research setting. This perspective can be useful for Laura to best consider locally appropriate ethical principles both when submitting to the REB at her home institution, and in the country of research (if local submission is possible). Additionally, the ongoing relationship between these two students could help Laura to appropriately navigate contextual, cultural and ethical issues that might arise during the data collection process and other doctoral research stages.

International sharing of research findings. Paul can present his research to Laura and her associated academic institution, and vice versa. This can be done via technological platforms or in-person, depending on the funds available and other barriers that may exist.

Reaching audiences outside of the institution. Paul can provide Laura with insight to help identify the audiences where the research findings can have the greatest impact. These audiences could be specific decision-makers or simply be affected communities. Additionally, Paul can help Laura craft her message in order for it to retain its meaning while being optimally understood by the audience. Conversely, Laura could provide strategies and tact to help Paul reach international audiences such as HIC administrations and funders.

Connecting the Stages and "Intermediary Outcomes" to Desirable Characteristics

We foresee improved possibilities for success if the participating students or the DSCA relationship has certain desirable characteristics. In Table 1 (see Appendix) we present these desirable characteristics and outline the connections between them, the prototypical stages, the "intermediary outcomes," and the Core Competencies in Global Health Practice and Research.

Barriers, Key Opportunities and Challenges

Existing structures create numerous barriers that could preempt the implementation of the proposed DSCA. Nonetheless, these same structures can facilitate certain key opportunities for success. Students pursuing a DSCA should foresee barriers and tackle them in advance. In some cases, it might be necessary to instead highlight the key opportunities, to show that the value of a DSCA outweighs the concerns that are presented as barriers. In addition to overcoming barriers and maximizing key opportunities, we also recognize that there are important challenges that could arise in the practice of a DSCA. Although a barrier could impede a student from ever engaging in a DSCA in the first place, a challenge could stop a DSCA from being successful according to the goals that the students seek to achieve. Here, we discuss some of these barriers, key opportunities and challenges that relate to the DSCA.

Barriers

Although we recognize that institutional firewalls (i.e., regulatory structures such as memoranda of understanding, terms of reference or departmental approval) can often be useful for some important purposes,¹⁸ we do not see these types of bureaucratic or formal agreements as necessary for all styles and levels of engagement that could be pursued using a DSCA. Conversely, we can see instances where their presence or absence could impede complementary relationships.

The absence of regulation could be a problem when at least one of the doctoral students is housed in an institution that prohibits inter-institutional engagement without the prior development of signed agreements. This is despite many possible complementarity arrangements being of a very different nature than the partnerships for which such processes are truly intended. This possibility seems more likely in institutions with particularly hierarchical structures in which authorization from supervisors is required for all external

communication. In such a case, the time and effort needed to respond to bureaucratic requirements might be incommensurate with the early and exploratory phases of a complementary relationship.

At the other end of the spectrum, existing regulatory structures may oblige the complementary doctoral student parties to review a series of documents and prioritize the alignment of their relationship with the established terms of reference instead of simply pursuing areas of mutual interest and connection that are relevant to their research. Furthermore, regulatory structures could influence activities beyond collaborative arrangements between students; for example, the process of securing an appointment to be a committee member in another institution can often be rather involved and lengthy, serving as an institutional firewall that impedes students' capacities to secure committee members across borders. Along these lines, faculty appointments may not be crafted in ways that allow a potential committee member to supervise students from another institution.

In order to overcome potential regulatory structures that serve as institutional firewalls, we encourage doctoral students to be aware of their institutions' existing norms and expectations as they approach complementary relationships. Such awareness can allow students to recognize the purposes of structures in order to most efficiently work within the expectations when appropriate, or challenge the expectations when they are an impediment. Ideally, awareness of the existing or expected regulatory structures could lead to the doctoral student encouraging a positive change, preserving the useful intentions of the regulatory structures, but improving their relevance and flexibility.

In addition, complementarity could be viewed as competition by existing relationships. This situation would occur when the students interested in pursuing a DSCA are from the many universities outside of established institutional relationships rather than the few that are inside. To the credit of the global health research field, supportive relationships between institutions are a common arrangement. Such arrangements are particularly prevalent for doctoral programs in LMICs that are often offered in "joint" or "sandwich" formats in partnership with institutions in HICs.¹⁹ In cases of pre-existing relationships, it is entirely conceivable that the partner institutions are reticent to allow their students to engage in collaborative activities with a colleague from an outside university. In well-intentioned cases this reticence could stem from concerns about the student's schedule and availability, or that additional connections could weaken the existing arrangement. In other cases, the restrictions on a doctoral student could be due to reasons for exclusivity that are more intentional, such as the phenomenon of partnerships created for competitive advantage, with the distinct objective of limiting opportunities for rival institutions.²⁰ Regardless of the underlying currents of an existing relationship, doctoral students who are affiliated with partnership programs or departments in partnerships should be aware of the implications that this can have on complementary relationships with student colleagues from other institutions, and proceed accordingly.

The absence of initial connections between doctoral students could create a barrier to the development of a DSCA. According to the structures in place for global health research, the current default is for doctoral students from different institutions conducting similar research in similar locations to operate in parallel without connecting with one another. With a lack of structures to connect doctoral students, we suggest that global health doctoral students make a conscious effort to identify counterparts and reach out to them. Referring to the example of Laura and Paul, we argue that this responsibility resides primarily with Laura since she is actively deciding to engage in research in Paul's local environment/context, and we would suggest that this student (i.e. Laura) should visit and engage with local universities respectfully and appropriately.

Language differences could also be a barrier to student connection leading to a DSCA, particularly when otherwise complementary doctoral students do not share a lingua franca. Accordingly, reduced fluency on behalf of one of the counterparts in the language in which they choose to communicate can limit the extent of dialogue between the two. Even in instances where complementary doctoral students share a common language and comfortable fluency, the advantages of a DSCA could be limited if one student is unable to communicate in the language of operation of the other's institution. When language barriers are present between a visiting doctoral student researcher from a HIC

and a local doctoral student researcher in their own country, we see the responsibility to overcome the barrier as resting primarily with the visitor. We concede that attaining fluency in one of the languages of the country in which they are working could be a challenge for the student from a HIC, but encourage all visitors to engage in some learning. For some, this might require devoting time to intensive language study. For many others, it could involve learning key phrases or hiring a paid interpreter to increase the opportunity for communication on more local terms.

Insufficient resources can also be a barrier for students to engage in a DSCA. Employing a DSCA requires a time commitment, since it involves additional activities as compared to those typically expected over the course of a doctoral program. Additionally, making time to connect when students are in different time zones may pose further challenges. Some doctoral students have schedules in which the time devoted to academic activities is limited by outside employment used to cover living expenses. In order to overcome these challenges, better funding for global health doctoral students could allow these students to engage in DSCA activities in ways that do not currently occur. Furthermore, long-distance communication generally has an associated monetary cost, which could be a barrier to the adoption of a DSCA. The availability of funding to cover communication costs could therefore be an important catalyst to ensure that complementary students capitalize on available communication opportunities.

Key Opportunities

The combined efforts that occur through a DSCA can trigger various mechanisms to create an increase in research production and dissemination. Ultimately, this can result in more publications, reports and presentations. The mechanisms that can create an increase in research production and dissemination include a sense of shared responsibility and motivation, and an idea pool that allows for increased creativity and a more thorough and reflective grasp of both literature and lived experiences.

More specifically, sharing ideas and collaborating with colleagues creates an additional forum to engage with the research material, keeping the process more interesting and allowing reflections that might not be possible with the doctoral students' existing web of contacts. This pool of ideas allows for the emergence and development of more creative solutions than what is possible with individuals working alone. It also allows the collective circulation of a larger pool of research findings and lived experiences and the interpretation and discussion of this information from multiple perspectives. In this way we see a DSCA as having the potential to allow participating doctoral students to expand the depth and breadth of their theses, and also engage in side projects as time permits. The result of this collaboration/exchange would be that the participating students conduct more research.

Similar to the way in which some PhD students have found community engagement to be a motivating factor to stay on track in doctoral studies,²¹ we also suspect that the expectations of doctoral student colleagues will strengthen the motivation of the individual partners to carry research efforts through to completed and actionable products. Additionally, having collaborators can mean that participating students work together to publish, present or create knowledge translation tools. The sum effect of these elements is the potential to have "more actionable products per unit of research," an important benefit of a DSCA.

Involvement in a DSCA among students can create an increase in inter-institutional partnership potential. Global health actors understand partnerships as arrangements that can improve research quality, knowledge exchange and develop research capacity, making partnerships a generally positive connection between institutions.¹⁸ Doctoral student complementarity can reinforce existing institution-level partnerships by adding another point of connection to increase the partnership's activity or by establishing relationships that could lead to new partnerships.⁹ In addition to the numerous benefits available to doctoral students as individuals, interested candidates should remember the potential institution-level benefits as well when considering whether a DSCA is a productive use of time, or when justifying the utility of the activity to colleagues.

As compared to established academics, doctoral students are in some ways in an advantageous position to conduct global health

research.⁹ For example, doctoral students do not face the pressures of securing tenure, allowing the freedom to be more creative and allocate more time to their research, which in turn permits a more nuanced approach to their particular research endeavours.⁹ Additionally, doctoral students have an extended period of time (approximately three to five years depending on the academic institution) to focus exclusively and comprehensively on their particular research goals and interests; they are able to engage deeply with the related literature, discuss their ideas with relevant top scholars and experts and interpret and disseminate our findings with the guidance of academic supervisors and dissertation committee members.⁹ Some of the positional advantages of doctoral students to global health research in general are particularly suited to complementarity. For example, the flexibility mentioned above also allows more time to be actively devoted to building and nurturing networks and partnerships, a luxury not as readily available to new faculty members.²² Accordingly, the doctoral studies phase of one's career can be an opportune time to develop relations that are drawn upon later.

Challenges

Despite good intentions, the persistence of power dynamics in the larger world could lead to unequal benefits from a DSCA. We have conceived of the idea of the DSCA from our perspective as Canadian-based global health students. Beyond the obvious benefits that we see for ourselves in engaging in a DSCA, we want to ensure that this approach would be equally as beneficial for students enrolled in academic institutions in LMICs. Unfortunately, as students from Canada, it is not entirely possible for us to determine what the most valuable or most plausible benefits would be for our complementary doctoral students from LMICs. For this reason, we hope to engage doctoral students from LMICs in the development of this idea and be ready to yield to their priorities while maintaining the values that attracted us to this idea in the first place. In the meantime, it is our responsibility to remember the temptation and ease of Northern partners to reproduce colonial legacies through inequitable global health research partnerships, and actively counter this possibility.^{23,24}

Indeed, the situation of doctoral students in LMICs could make complementary relationships either highly beneficial or only marginally so, and there are implications at both ends of this spectrum. According to the experiences recounted by Walker et al. from a group of doctoral students from LMICs teamed with Canadian counterparts, there were "concerns about [a] lack of academic resources, training opportunities and funding."²⁹ This position of vulnerability relative to Canadian students, who possess relatively abundant resources and opportunities, could lead doctoral students from LMICs to engage in complementary relationships at the weaker end of a significant power differential. In this situation, it is possible that students from LMICs engage in a DSCA under terms that

are not fair, because they are hoping to access important benefits through the relationship.²⁵ Conversely, should the benefits for doctoral students from LMICs be negligible, there could be a desire to complement Canadian students out of obligation as good hosts or pressures from academic superiors hoping to curry the favor of the Canadian institution. In this case, a miscommunication or unequal power dynamic could lead to a relationship that is exploitative from the perspective of the doctoral student from the LMIC.

Beyond the issues stated above, there is the possibility for a misunderstanding between parties. Doctoral students engaging in a DSCA will undoubtedly do so with at least some pre-conceived ideas in mind and a particular vision about what could constitute a positive relationship. If these ideas are not clearly communicated from very early in the process, there could be substantial possibilities that the DSCA be founded on expectations that are unrealistic or undesirable to the student counterpart. Additionally, there could be disputes about authorship or ownership of the products of doctoral student complementarity. For this reason, we support a commitment to "open, frank discussion" between complementary doctoral students as an initial step in a DSCA. Specific tools or agreements can facilitate this process, although they will not always be necessary.¹⁸ We recommend the consideration of tools that encourage constructive discussion without being unnecessarily onerous. An example of this is the Canadian Coalition for Global Health Research's Partnership Assessment Tool, which is designed to be flexible and could be appropriate to many types of complementary relationships.¹⁸

Conclusion and Next Steps

With a consideration of the barriers, key opportunities and challenges of the proposed DSCA, we hope that global health doctoral students will consider this approach and its application to their independent doctoral research studies. We see the DSCA to be in line with the values and principles that drive us in our pursuit of global health research, as well as with the Core Competencies in Global Health Practice and Research.² We anticipate that our proposed approach, at the very least, will serve as a starting point for global health doctoral students from HICs and LMICs to think about the importance of engaging in an ongoing inter-cultural, inter-disciplinary and international dialogue related to their respective research throughout their doctoral studies.

As students from a HIC conducting research in LMICs, we are able to foresee certain benefits of DSCA arrangements. Our colleagues from LMICs might see these differently. For this reason, we especially call on doctoral students from LMICs to bring forth their perspectives about the potential opportunities and the possible perils of a DSCA in practice.

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