

Developing a Competency Framework for Population Health Graduate Students Through Student and Faculty Collaboration

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Abstract

Defining competencies within health disciplines is important because it provides a shared understanding of the fundamental knowledge, skills, and attitudes necessary for research and practice while also offering a practical reference point for academic preparation and professional development. However, existing literature regarding competency frameworks does not address the unique needs of interdisciplinary population health research graduate students. The purpose of this project was to understand the competencies desired by interdisciplinary population health research graduate students within the Healthy Populations Institute (HPI) at Dalhousie University and to create a competency framework on which training and program development could be based. A student-led initiative was undertaken to identify core competencies necessary for interdisciplinary population health research graduate students from both traditional (e.g., health promotion) and nontraditional health (e.g., political science) backgrounds. Data were collected and analyzed via three phases: environmental scan, community resource mapping, and consultations with HPI research scholars. Through the environmental scan, core competencies and guiding principles were identified. Community resource mapping of local employment, volunteer, educational, and/or skill-building opportunities resulted in the development of a database. Consultations confirmed the validity of competencies identified in the scan and elicited further resources and suggestions for educational and professional skill development. This project resulted in a unique competency framework that will inform ongoing program development and foster additional opportunities for graduate students within HPI. The process of creating this framework may also be of value to other universities wishing to develop or refine their own set of competencies.

Keywords

graduate education, competencies, interdisciplinary, Canada

Introduction

Defining competencies within health disciplines is important because it allows for a shared understanding of the fundamental knowledge, skills, and attitudes needed for prepare graduates to positively impact the communities they will serve (Public Health Agency of Canada [PHAC], 2008; Sullivan, Velez, Edouard, & Galea, 2018). Discipline-specific competencies provide a practical reference point for training, academic preparation, and professional development (Barry, Battel-Kirk, & Dempsey, 2012). Overall, knowledge about the competencies

shared across health disciplines is needed to help guide curricular and program development (Jogerst et al., 2015). This ensures students are prepared with standardized and measurable competencies required for practice (Ladhani, Scherpbier, & Stevens, 2012).

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Table 1. Healthy Populations Institute (HPI) Student Research Scholar Terms of Reference (HPI, 2018c).

Criteria for student research scholar membership

One of the following criteria must be met:

- A graduate student in the Faculties of Health, Medicine, or Dentistry with an interest in population health
- A graduate student enrolled in the PhD in Health or Interdisciplinary PhD program
- A graduate student from other Faculties whose supervisor is either a HPI Senior or Associate Research Scholar

Roles and responsibilities

- Attend HPI-hosted events
- Manage or assist with the organization of one HPI-hosted event (e.g., guest speaker event)
- Present research at an internal or open meeting/event, including presentation prior to a thesis defense
- Provide permission to display appropriate research and personal information on website
- Agree to be listed on the HPI's distribution list and receive e-mail notices

Opportunities

- List membership on CV/résumé and as part of signature line on correspondence
- Participate in a research grant, as appropriate
- Participate in Senior and/or Associate Research Scholars' research workshops, as appropriate
- Join one or more HPI Research Cluster, as appropriate
- Represent the Student Research Scholars on the HPI Executive Committee, and/or on the HPI Student Research Scholar Society
- Access research expertise of Senior and Associate Research Scholars

Recently, more professional graduate degree programs in Canada are guided by competency-based education approaches, although according to Zlatkin-Troitschanskaia, Blömeke, and Pant (2015), competency assessment in higher education is underresearched. Competency-based education can be designed at various levels of higher education, including at the university, program, and individual course levels (Berdow & Evers, 2010). In the case of this competency-based education project, an intentionality, or "purpose," component was included where students took a great deal of initiative for their own development of competence in their program of study within their university (Stelma & Fay, 2014, p. 517). In this case, the focus was on developing a framework tailored to graduate students affiliated with the Healthy Populations Institute (HPI), described below, to further develop their research skills.

HPI is a university senate-approved research institute at Dalhousie University. This is a research-intensive university located in Atlantic Canada. It is one of the oldest universities in Canada (founded in 1818) with approximately 19,000 students enrolled across 13 faculties (Dalhousie University, 2019). HPI was formed with the mission to improve population health and promote health equity by understanding and influencing the complex conditions that impact the health of communities (HPI, 2018a). *Population health* is the term that is more commonly used in Canada, and for the purpose of this article, it is defined as an "approach used to maintain and improve the health of the entire population and to reduce inequalities in health between population groups" taken from both traditional (e.g., nursing, health promotion, public health) and nontraditional (e.g., political science, urban planning) health perspectives (Health

Canada, 1998, p. 1; see also Kindig & Stoddart, 2003). HPI is operated by a Scientific Director and a Managing Director who are governed by a Management Committee composed of representatives from the Faculties of Health, Medicine, and Dentistry (HPI, 2018b). HPI has three main membership categories: Senior Research Scholars, Associate Research Scholars, and Student Research Scholars (SRS; HPI, 2015). Researchers who are considered experts in a health-related field with an established grant capture and publication record are Senior Research Scholars. Associate Research Scholars are researchers who are in earlier stages of developing their publication and grant history, and this membership category is also open to postdoctoral fellows. HPI began accepting SRS memberships in the summer of 2016, which are offered for a 1- to 2-year period with a renewal option for returning doctoral students. Table 1 outlines the terms of reference pertaining to the criteria, roles, and responsibilities, and the opportunities available for SRS within HPI.

The engagement of SRS in HPI led to internal discussions regarding the development of a competency framework to promote learning and skill development. Competency frameworks for health promotion and other health-related disciplines exist, but these competencies are mostly intended to outline discipline standards for health professionals, rather than for use by graduate students (Barry et al., 2012; Hyndman, 2009), including those focused on interdisciplinary population health. The Association for Schools & Programs of Public Health's *Framing the Future Frameworks* (2019) address the competencies needed for students at all levels (e.g., undergraduate, graduate) studying in the field of public health; however, the HPI SRS included students studying in both

traditional (e.g., health promotion) and nontraditional health programs (e.g., political science, urban planning) who have an interest in population health. Therefore, a framework was needed to reflect the research and research-related competencies of SRS within HPI.

In this project, a competency framework was developed for HPI SRS on which additional training and program development could be based. In addition, it was assessed whether the learning opportunities currently accessible to SRS translated to helping address and/or develop these competencies. The following questions guided the aims of this project: (1) What are the wanted skills, research, and knowledge-based competencies of HPI SRS? (2) Does HPI SRS membership offer opportunities for the development of these competencies? (3) What competencies already exist in population health promotion that are relevant for HPI graduate students? (4) What additional resources are available at Dalhousie University for students that promote these competencies? The results of this study will be used to inform the ongoing development of the HPI SRS membership (e.g., responsibilities and opportunities) to reflect the developed competencies and to inform the development of current and future opportunities that foster these competencies. Furthermore, other population health programs may be able to adapt this framework for their use or adopt our framework development process to meet their own teaching and learning needs.

Method and Results

A number of health pedagogy-related frameworks exist; however, the methods used in their development differ. Most health pedagogy-related frameworks use a multi-method process (Battel-Kirk et al., 2012; Redwood-Campbell et al., 2011; Voss, Matthews, Fossen, Scott, & Schaefer, 2015). When deciding which methods to use for this framework, the SRS chose multiple methods reflected in existing literature that were feasible for a student-led project. An element of reflection was also included, in the form of writing this article, which is noted as a critical part of developing pedagogy (Horsfall, Cleary, & Hunt, 2012).

Data collection were conducted in three phases to identify and guide the development of relevant training and learning opportunities for HPI SRS. Data collection involved an environmental scan of existing frameworks and resources, stakeholder consultations, and framework development, all of which informed the development of the final framework. Two SRS were hired as research assistants to assist with each research phase. This provided an opportunity for faculty to mentor these students in developing their research skills and to develop student capacity for conducting research. This project was submitted to the Dalhousie University Research Ethics Board; however, approval was waived according to the

Tri-Council Policy Statement on the ethical conduct for research involving human, which states that “quality assurance and quality improvement, program evaluation activities and performance reviews, or testing within normal educational requirements . . . do not fall within the scope of REB review” (Canadian Institutes of Health Research, 2014, p. 20). All primary data included as part of the framework development process can be accessed on reasonable request to the corresponding author.

Phase 1: Environmental Scan

Existing Framework Synthesis. The first phase of the project occurred from September to December 2017. Scoping reviews are often a first step in framework development as they help synthesize extensive and diverse bodies of literature that may not be well understood (Pham et al., 2014). Other teams have used a scoping review of relevant literature and frameworks as a preliminary step in their framework development (Battel-Kirk et al., 2012; Redwood-Campbell et al., 2011). Existing health promotion and population health-related competency, skill, and accreditation frameworks were systematically collected through a search of peer-reviewed and grey literature (i.e., via CINAHL, PubMed, Google Scholar, and through snowballing). This search was completed by a small group of six SRS. The query for this search was designed in consultation with a research librarian specializing in health promotion. Search terms included the following: best practic*, competenc*, skill*, capacity*, outcome*, proficienc*, aptitude*, evaluat*, health, promot*, public, community, population*, develop*, population health, and health promotion. This systematic search yielded 26 relevant results and collected frameworks were uploaded to a shared online drive and summarized in a shared document.

Both academic and practice-based frameworks were included and discussed by the group if the content was nonclinical in focus and population health related. Competencies from all relevant frameworks were extracted and inputted into a spreadsheet by SRS members of the environmental scan group. Subsequently, the competencies and skills identified from these frameworks were then collated into themed categories based on an inductive thematic analysis procedure by the environmental scan group.

From this initial environmental scan and analysis, these categories identified six core competencies (i.e., communication; knowledge; leadership; programming and evaluation; research, policy, and practice; and support and enable change) and four guiding principles (i.e., capacity enhancement, community building, critical reflection, and cultural safety) that were important for the education and professional development of SRS. Cultural safety refers to being aware of one’s own words, actions,

and environment so that others from all backgrounds and cultures feel safe, dignified, and respected. These evidence-based categories formed the foundation on which the HPI framework was developed. This foundation was expanded and refined during the next two phases.

Existing Community Resources Mapping. This framework also included a review of existing resources for SRS, which follows similar framework development in the field of nursing (Voss et al., 2015). Environmental scans, such as the one used for community resource mapping in this phase, are useful for integrating the specific needs of a community, such as the SRS (Graham, Evitts, & Thomas-MacLean, 2008). A second smaller group of five SRS conducted the community resource mapping exercise to assess the local training and employment environment via website scanning and informal communications with staff and volunteers at local organizations providing health research-related resources (e.g., funding, training, volunteer, and paid work opportunities). By doing so, this group identified and compiled a list of resources offered by local health- and research-based groups and organizations (e.g., provincial health authority, research support organization, the Dalhousie University Centre for Learning and Teaching). Resources included paid or volunteer positions, workshops, funding opportunities, competencies that the organization desired in population-health graduate students, and any information on additional groups or organizations that should be contacted.

As another part of the mapping of existing community resources, health-related graduate-level courses offered at the university were identified. A total of 52 health and/or health research-related groups and organizations were identified during the community resource mapping exercise, in addition to 65 available health-research graduate-level courses. These data will serve as an informative inventory for HPI and for population health research students in the local area. Additionally, this phase of the project helped ensure the sustainability and feasibility of implementing the framework, as various resources and organizations beyond HPI and Dalhousie University were identified. Finally, by comparing these existing resources to the thematic categories from the framework collection phase, the group was able to identify resource gaps available to SRS to determine opportunities to enhance graduate student success and validate the relevance of identified competencies to the local population health research training and employment environment.

Phase 2: Consultations

To build on the results of the framework collection phase, two concurrent consultation focus groups took place at a

HPI meeting, followed by a large group discussion. Consultations are an important part of framework development that aim to provide feedback at varying stages of the development process, as it “reflects general agreement, allowing for variation in details” (Haggarty et al., 2007, p. 343). Both were led by SRS. One focus group was with SRS ($n = 8$) and one with Senior and Associate Research Scholars ($n = 12$). Both focus groups were asked the same set of questions using a semistructured guide. The questions focused on four main categories: needs of population health graduate students (i.e., “What do population health graduate students need in their education?”); preliminary competency framework review (i.e., “What is missing from the framework?”); framework implementation (i.e., “What obstacles or challenges to implementing such a program/framework look like?”); and suggestions for improvements (i.e., “Is there anything else we should include?”). Hand-written notes from the focus groups were analyzed using an inductive thematic analysis approach to determine consensus-based themes from stakeholder input (Nowell, Norris, White, & Moules, 2017).

Graduate Student Consultations. The graduate student consultation focus group was held to identify opportunities for HPI program development and impact optimization. All current HPI SRS at that time ($N = 25$) were invited to attend the focus group session as part of an HPI gathering. A total of eight graduate students participated in the consultation, reflecting a 32% participation rate. The participants discussed their wants and needs as SRS and suggested potential options for HPI to respond. In addition to identifying potential program changes, SRS also discussed and identified various assets of their program and training. The graduate student consultation was led by an undergraduate student who was participating in an internship with HPI.

Expert Consultations. A concurrent focus group was held with Senior and Associate Research Scholars as part of a HPI meeting. A total of 12 of a possible 36 faculty members participated in the consultation, reflecting a 33% participation rate. The goal of this focus group was to identify how HPI can develop the SRS training program and competency framework, based on the findings from the environmental scan and community resource mapping phases. This goal was reached by identifying gaps in the preliminary framework and resource list and by identifying opportunities (e.g., additional mentorship) to meet the needs identified in the SRS focus group consultation and large group discussion. The expert consultation was led by two Master of Arts in Health Promotion candidates who held leadership positions (e.g., co-chairs of the SRS group) within HPI.

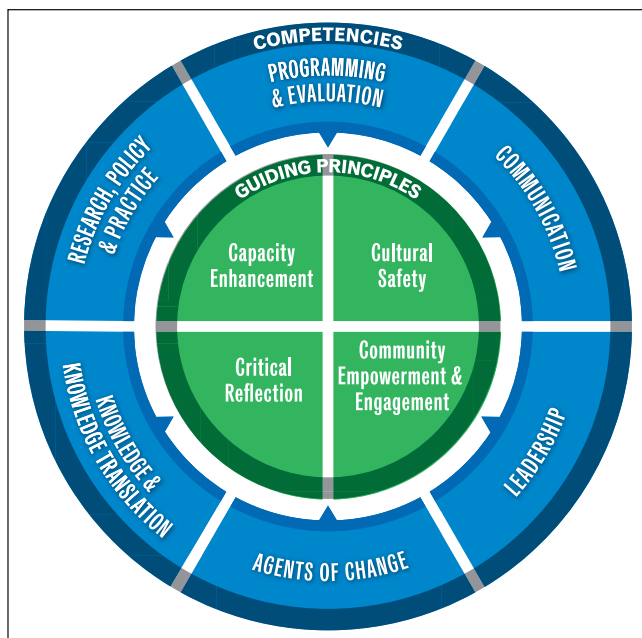


Figure 1. Illustrative representation of guiding principles and competencies.

Consultations with graduate students and experts reinforced the validity and importance of the guiding principles and core competencies identified in the environmental scan phase. Both consultation groups approved of the preliminary competency framework. Moreover, these discussions yielded additional resources and suggestions for skill development to further enhance SRS training. When asked about additional competencies or skill sets that were desired, the student consultation group suggested more opportunities for interdisciplinary work and applied learning. Key areas of interest were increased knowledge of health policy, grant writing workshops, and workshops on research-specific skills. The expert consultation group agreed that interdisciplinary work should be a key focal area moving forward and suggested that HPI could be a facilitator of increased collaborative learning opportunities (e.g., research assistantships, summer institutes, knowledge and skill-building workshops on interdisciplinary methodologies and methods). The graduate student and expert consultations also provided an opportunity for those not involved in earlier stages of the project to provide their feedback on the preliminary competency framework, as well as to the list of identified groups and organizations from the community resource mapping exercise.

Phase 3: Final Framework Development

Findings from the environmental scan and consultation phases were integrated with a framework-building

exercise, which was undertaken by the project team. Through discussion and consensus-based decision making, the competencies identified in the existing framework synthesis phase were integrated with the findings from the consultation phase to create a unified framework. This framework was sent via e-mail to the broader HPI membership for comments and feedback, such as Research Scholars who were unable to attend the original consultation. Following the acquisition of feedback, the project team reconvened for a second round of consensus-led discussion to integrate HPI membership perspectives into the final framework. For example, based on feedback, more tangible aspects or measures of the framework components were included so that the attainment of the competencies could be more easily evaluated. The competencies and guiding principles included in the final framework are shown in Figure 1 and Table 2. In Figure 1, we outlined the four identified guiding principles and the six core competencies. The presented core competencies summarize the skills and capacity recommended for graduate students to acquire and possess, while the guiding principles overarch the competencies and should be applied to each competency. These competencies and principles are included here to present the results of the framework development process, and this is the main goal of this article. Ongoing testing and evaluative work are being done by the SRS to assess the importance of this framework to population health students in the wider university community and will be presented in the future. “Testing” is an important step in validating the importance of a framework (Battel-Kirk et al., 2012; Redwood-Campbell et al., 2011).

Based on our student-led process, it was determined that HPI SRS want to develop practical *knowledge* and skills on *research, policy, and practice*, as well as *programming and evaluation*, and *knowledge translation*. With these skills and knowledge base, HPI SRS may become population health *leaders* through effective *communication* of knowledge and evidence, in an effort to *engage and enhance the capacity* of communities and other partners. When doing so, HPI SRS have indicated that *cultural safety* and *critical reflection* are key principles they wish to maintain.

Discussion

The purpose of this project was to develop a competency framework for HPI SRS on which training and program development could be based. Additionally, this project examined whether learning opportunities offered to SRS translated to supporting the development of the competencies. Phase 1 (Environmental Scan) identified six core competencies and four guiding principles through a systematic search of existing frameworks. This phase also

Table 2. Guiding Principles and Core Competencies Contained Within the Framework.

Principle/competency	Brief description
Guiding principles	
Capacity enhancement	The ability to collectively develop and enhance the knowledge, abilities, and resources of partners in the community (Allegrante et al., 2009; Barry et al., 2012; Belanger et al., 2012; Health Promotion Canada, 2015; Jogerst et al., 2015; PHAC, 2008; Shilton et al., 2008).
Critical reflection	The ability to “[assess] and [challenge] the underlying beliefs, values assumptions, discourses and approaches to health promotion practice from the individual to the population level” (Tretheway, Taylor, O’Hara, & Percival, 2015, p. 217).
Community empowerment and engagement	The practice of promoting health by enabling change, providing support, and advocating for meaningful community involvement (Allegrante et al., 2009; Health Promotion Canada, 2015; Ladhani et al., 2012; Shilton et al., 2008).
Cultural safety	The ability to apply appropriate sociocultural methods and techniques to all aspects of community and population health promotion (Allegrante et al., 2009; American College Health Association, 2015; Barry et al., 2012; Czabanowska et al., 2013; Health Promotion Canada, 2015; Jogerst et al., 2015; Ladhani et al., 2012; National Commission for Health Education Credentialing, 2015; PHAC, 2008).
Core competencies	
Leadership	The ability to work effectively with stakeholders, manage assets and team members, provide professional development opportunities, communicate and share knowledge effectively, act as an initiator, and create a shared vision for team members (Allegrante et al., 2009; Barry et al., 2012; Belanger et al., 2012; Czabanowska et al., 2013; Health Promotion Canada, 2015; Jogerst et al., 2015; Ladhani et al., 2012; National Commission for Health Education Credentialing, 2015; PHAC, 2008; Shilton et al., 2008).
Agents of change	The ability to enable change through creating conducive environments, advocate for health, mediate through partnerships and collaborate to improve health outcomes and maximize effectiveness (Allegrante et al., 2009; Barry et al., 2012; Czabanowska et al., 2013; National Commission for Health Education Credentialing, 2015; PHAC, 2008; Shilton et al., 2008).
Knowledge and knowledge translation	Knowledge should be composed of ethical values, principles and values, and evidence-based practice. Knowledge should be formed through credible education, opportunities to apply knowledge and professional development (American College Health Association, 2015; Barry et al., 2012; Belanger et al., 2012; Hyndman, 2009; Jogerst et al., 2015; PHAC, 2008; Shilton et al., 2008).
Communication	The ability to effectively communicate to professional and lay audiences through written, verbal, and nonverbal communication; implement new technologies; and develop interprofessional communication and teamwork skills (Barry et al., 2012; Belanger et al., 2012; Czabanowska et al., 2013; Health Promotion Canada, 2015; Jogerst et al., 2015; Ladhani et al., 2012; National Commission for Health Education Credentialing, 2015; PHAC, 2008; Shilton et al., 2008).
Research, policy, and practice	The ability to apply analytical skills and use evidence-based practices to implement or change existing policies and practices (American College Health Association, 2015; Barry et al., 2012; Belanger et al., 2012; Health Promotion Canada, 2015; Hyndman, 2009; Ladhani et al., 2012; National Commission for Health Education Credentialing, 2015; Shilton et al., 2008).
Programming and evaluation	The ability to organize and evaluate programs and services through needs assessments, planning, evaluation, implementation, and administration skills (Allegrante et al., 2009; American College Health Association, 2015; Barry et al., 2012; Belanger et al., 2012; Gilmore, Olsen, Taub, & Connell, 2005; Health Promotion Canada, 2015; Hyndman, 2009; Jogerst et al., 2015; National Commission for Health Education Credentialing, 2015; PHAC, 2008; Shilton et al., 2008). These skills can be developed through education and should be implemented with sustainability at the forefront (Health Promotion Canada, 2015; National Commission for Health Education Credentialing, 2015).

identified 52 health and/or research-based groups and organizations through community resource mapping. Phase 2 (Expert & Graduate Student Consultations) confirmed the importance of the competencies and guiding principles that were later incorporated into Phase 3 (Framework Development). The consultations also provided additional opportunities for skill development and SRS training. A finalized framework was created through incorporating feedback from Senior and Associate Scholars affiliated with the HPI.

The process of developing a competency framework for population health graduate students has aimed to fill a void in current graduate education in Canada, while simultaneously developing skills and providing experiences to approximately 10 current HPI SRS and one undergraduate student intern. In developing the framework, the SRS acquired and refined numerous skills contained within the framework itself, often identifiable as core competencies. The six core competencies were demonstrated throughout the development process:

Leadership was practiced through both the community resource mapping activity and the expert consultations in which students became active *Agents of Change*, creating connections with stakeholders in health research such as university faculty, community organizations, and policy makers to advocate for the needs of current and future population health graduate students. Students were required to autonomously identify, contact, and engage stakeholders, creating further capacity to individually and collectively expand health research networks in the future. *Communication* was practiced through similar avenues, such as the students' engagement in collaborative teamwork, task delegation, and facilitating networks among fellow students and external stakeholders.

Other competencies were applied broadly across the entire framework development process, and well as emerging in more specific tasks. *Research, policy, and practice* was practiced through the opportunity to conduct a systematic review of literature and an environmental scan, as well as strengthening skills in facilitating focus groups for research, and using thematic analysis methods. Participation in research activities such as focus groups is especially valuable, as it provided exposure to research at the graduate level, an opportunity not often available among undergraduate students. All of these activities informed the framework, which is intended to act as a guiding policy for future student scholars. *Programming and evaluation* were generally practiced through the act of framework development, which sought to evaluate students' needs and HPI's capacity to meet them. The competencies were also practiced concretely by students involved with the graduate student and expert consultation event, which required planning and coordination skills, as well as applied research skills (e.g., developing semistructured focus group guides, leading group consultations, and memoing skills). *Knowledge and knowledge translation* were initiated from the beginning of framework development and are likely to continue being practiced and refined as the framework is implemented in HPI and shared at conferences, workshops, and publications.

In addition to acting as a meaningful process for the student researchers involved, this work is significant as it differs from other existing frameworks in the area of population health. For example, this framework specifically focused on graduate student development and is therefore unique compared to frameworks for workers within population health professional or related fields (Allegrante et al., 2009; Barry et al., 2012; Belanger et al., 2012; Health Promotion Canada, 2015; Hyndman, 2009; Jogerst et al., 2015; Ladhani et al., 2012; PHAC, 2008; Shilton et al., 2008). Additionally, previous competency frameworks have had a narrow focus on core competencies surrounding the field and

practice of health promotion (Allegrante et al., 2009; Barry et al., 2012; Health Promotion Canada, 2015; Hyndman, 2009; Shilton et al., 2008). Furthermore, the few frameworks developed for public health workers and students have specifically centered on public health programs (Association for Schools & Programs of Public Health, 2019). In contrast, our work is broader in scope and focuses on the competencies desired by population health graduate students from varying health disciplines.

Although competency-based education can be designed at various levels of higher education, this project focused at the level of an interdisciplinary research institute, specifically focusing on affiliated graduate students, with the goal of further developing research competencies (Berdow & Evers, 2010; Hyndman, 2009). Competency development in higher education is under-researched, and this framework is one of the first of its kind to the authors' knowledge to address the broader needs of students in population health (Zlatkin-Troitschanskaia et al., 2015). However, there are linkages to other competencies developed, such as those focused on competency development with specific focuses, such as interprofessional health education (Taren, Kligler, & Lebensohn, 2019). Furthermore, this project addresses the need for a framework reflecting the research and research-related competencies of HPI SRS. Finally, the students leading this work possess valuable insight into the competencies that students might want to develop. This perspective makes student researchers well-suited to investigate potential professional and educational competencies, adding to the uniqueness and significance of the project.

This work was conducted by a single institute at Dalhousie University and is therefore specific to the graduate students' and program needs. As such, findings from this work may not necessarily be generalizable to all population health graduate students, as other schools, programs, or institutes may have needs differing from those of HPI SRS. However, the process identified here may be used as a model for framework development elsewhere. Additionally, the framework could be adapted to meet the needs of other students, and the process used to develop the framework could be useful for others wishing to develop their own framework.

Notably, the process for developing the framework validated the importance of the competencies within the framework itself. In other words, when reflecting on the project, many of the competencies that were identified during the process of developing the framework were gained by the SRS throughout the duration of this project. It also validated the need for a framework, as the framework allowed students to articulate the competencies they acquired through the research and development process.

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