Factors That Influence the Development of Interprofessional Education and One Health for Medical, Veterinary and Dual Degree Public Health Students at an Offshore Medical School

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Dedication and Acknowledgments

This thesis is dedicated to the memory of my beloved partner, David, whose belief in the value and transformative power of education led me to this path. It is also dedicated to my gorgeous mother, Chandra, who has supported me throughout my life and my wonderful sisters, Kamini and Nemme, who continue to be a tremendous source of support.

The research involved in this thesis would not have been possible without God. I must thank my tremendous supervisor, Dr. Ellen Boeren. I could not have completed this journey without her. I also very much appreciate the valuable guidance of my second supervisor, Dr. Julie Regan.

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List of Abbreviations

DVM	Doctor of Veterinary Medicine
IPE	Interprofessional Education
MD	Doctor of Medicine
MMR	Mixed Methods Research
MPH	Master of Public Health
OH	One Health
RIPLS	Readiness for Interprofessional Learning Scale
SOM	School of Medicine
SVM	School of Veterinary Medicine

Abstract

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Rohini Roopnarine

In recent times, the impact of globalization has led to the occurrence of threats to global health from diseases of animal and environmental origin. The latter events have led to recommendations by medical educators that Interprofessional Education (IPE) programs that include the principles of One Health (OH) should form part of the curricula of medical and veterinary programs, to equip graduates to effectively collaborate towards diminishing these threats. The transdisciplinary concept of OH provides a framework that engenders collaboration between professionals at the crossover of animal, human and environmental health. This study evaluates the implications of developing IPE that includes the principles of OH at the institution at which this research was conducted.

A sequential explanatory Mixed Methods Research approach was used to achieve the aims of this study which sought to attain the following: 1) to explore the readiness of Doctor of Medicine (MD) and Doctor of Veterinary Medicine (DVM) students who have no prior IPE experience for IPE that incorporates the principles of OH; (2) to explore the effects of prior IPE and OH exposure on the readiness of Master of Public Health (MPH) students for IPE incorporating OH; (3) to explore the perspectives of the faculty and administrators on the opportunities and challenges for developing IPE that incorporates OH for the core MD and DVM programmes and (4) use the information gleaned in this study to inform the development of IPE that promotes the concept of OH at this institution. A survey was used that included a validated scale to explore the differences in readiness between groups of students across the disciplines of the health professions. Two open-ended questions were added to the survey that revealed the students' knowledge about the relevance of One Health to practice. Faculty focus groups and an interview with one of the senior administrators of the Medical school were used to obtain their perspectives on developing interprofessional education and enhancing familiarity with OH among students. The analysis of the survey data indicated comparative differences in readiness for interprofessional education across the programs. A number of themes emerged from evaluating the student responses to OH that showed a clear omission of various components of definitions of the concept across the programs. Five key themes emerged from the faculty focus groups and interview that provided perspectives for informing the development of IPE that includes OH at this institution. These themes included the accreditation requirements for the programs and the expected role that interprofessional learning held within the traditional culture of each discipline.

The study concludes by providing recommendations for curricula and leadership changes as well as a vision for executing the institutional claim for supporting the philosophy of OH. Underpinned by theory, the discussion Chapter utilizes various theoretical lenses for evaluating this research. This research also contributes to widening the discourse on the development of IPE that includes OH in four ways. One by contributing original insight into the factors that influence the readiness of students across four disciplines for IPE and providing an explanation of these findings using the lenses of various theoretical frameworks. Secondly, although the literature reveals that others have identified gaps pertaining to IPE and OH content in the curricula of the MD and DVM programs, this research presents a focused study that provides insight into the specificity of these gaps. The latter is accomplished through comparisons that are made in comparing the differences in the

students' definitions of OH and its relevance to practice across the programs. The student responses about OH revealed specific gaps in the students' knowledge about OH pertaining to the following: the impacts of global warming resulting from climate change, on human and animal health; the effects of foodborne diseases of animal origin on human health; the impact of socio-cultural and environmental factors on the occurrence of zoonoses with implications for human and animal health; the role of the human-animal bond on human mental health and the implications of antimicrobial resistance for public health. This research also contributes to broader discussions pertaining to the development of IPE and OH by including students within the dual degree MPH program that demonstrate how gaps in the curriculum of the MD and DVM programs pertaining to IPE and OH can be bridged. Finally, this research provides a lens into the opinions of the faculty and administrators across four disciplines for informing the development of IPE that makes students more familiar with OH.

Keywords: One Health, Interprofessional Education, Medical, Veterinary, Public Health, student, faculty

Chapter 1: Introduction

This thesis reports on the findings of a study to determine the readiness of students across four disciplines of the health professions for Interprofessional Education (IPE) that incorporates the principles of One Health (OH) and the factors influencing its development. The institutional setting that is the location of the research, the global relevance of the study, its aims, research questions and importance are discussed in this chapter.

King et al. (2008) argues that a transformative change is required in the approach of current day health professionals to disease prevention and global health optimization, one that should embrace collaborative strategies by the medical and veterinary fraternity. The elimination of zoonosesi—the term used to describe devastating diseases of animal origin that are transmitted to man, such as Ebola—requires this type of collaborative approach (Cross et al., 2018). In order to address these threats to global health, medical educators have been urged to prepare graduates for a collaborative approach to clinical practice (Rabinowitz, Natterson-Horowitz, Kahn, Kock, & Pappaioanou, 2017). Courtenay, Conrad, Wilkes, La Ragione, and Fitzpatrick (2014) suggest that IPE promotes the development of these collaborative skills. According to the World Health Organisation (WHO, 2010), IPE occurs when "students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" (p. 7). The current threats to global health, however, require a transdisciplinary framework that promotes cooperation between health professionals. Degeling, Johnson, Ward, Wilson, and Gilbert (2017) advocate the concept of OH as the ideal framework for integrating the expertise of professionals across the sectors of animal, human and environmental health.

There is a growing body of literature that recommends IPE as a pedagogical tool for incorporating a sound understanding of the concept of OH. This recommendation is to equip graduates working at the animal-human and environmental interface for collaborative practice (Courtenay et al., 2014). The institution where this research was conducted, hereafter referred to as 'the institution' for ethical purposes, does not currently offer IPE within the core curricula of the singular programs for the Doctor of Medicine (MD) and Doctor of Veterinary Medicine (DVM) in the School of Medicine (SOM) and School of Veterinary Medicine (SVM), respectively. DVM students are introduced to the concept of OH in their fourth term course in Veterinary Public Health. One introductory lecture on OH was mandatory for MD students (students in this study had this exposure) but this lecture has now been removed.

The occurrence of IPE in the programs at the institution are depicted in Figure 1. Some MD and DVM students opt to undertake a concurrent Master of Public Health (MPH) as MD MPH and DVM MPH students and are hereafter referred to as dual degree students. The MPH program is located within the Department of Public Health and Preventive Medicine (DPHPM) in the SOM. These dual degree students are participating in IPE as the MD and DVM students share classes with one another. The MPH is a postgraduate program with a curriculum that incorporates a core course in OH. Thus, dual degree students are already participating in IPE that incorporates the principles of OH.

Currently, IPE also exists within other scattered segments of the University. Some MD, DVM and dual degree students also participate in the community run OH clinics which provide free health services to persons and their animals on the Caribbean island where the institution is located.

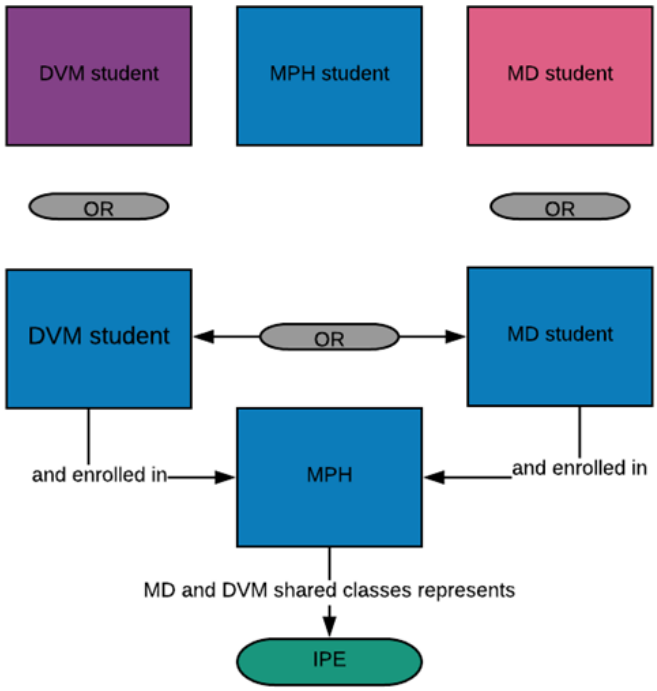

Figure 1. A depiction of where IPE occurs within the programs at the institution.

This study uses the 13-step framework for conducting Mixed Methods Research (MMR) discussed by Collins, Onwuegbuzie, and Sutton (2006). Step 1 defines the aims of this study which were fourfold: (1) to explore the readiness of MD and DVM students who have no prior IPE experience for IPE that incorporates the principles of OH; (2) to explore

the effects of prior IPE and OH exposure on the readiness of MPH students for IPE incorporating OH; (3) to explore the perspectives of the faculty and administrators on the opportunities and challenges for developing IPE that incorporates OH for the core MD and DVM programmes and (4) use the information gleaned in this study to inform the development of IPE that promotes the concept of OH at this institution. The location of the research is a private for-profit medical school that is based offshore in the Caribbean, catering to predominantly North American students that intend to return to the United States as qualified practitioners.

Collins et al. (2006) suggest that the study aims lead to Step 2, the research objectives which determine whether quantitative or qualitative methods are required to achieve the aims. This study had two objectives: (1) to describe the readiness of students for IPE (2) to explore the relationship between student readiness for IPE and the faculty perspectives on the need for development of IPE that includes OH at the institution.

1.1.Background

Marselle, Stadler, Korn, Irvine, and Bonn (2018) discuss that food safety, antimicrobial resistance, bioterrorism, climate change and zoonoses, such as Avian influenza viruses and Ebola, are growing public health concerns worldwide. This has led to stakeholders advocating for collaboration between professionals across the sectors of veterinary medicine, medicine and environmental health (Frankson et al., 2016). Berthe et al. (2018) regards OH as important for providing the type of collaborative framework required to halt the impact of these global disease threats.

As Evans and Leighton (2014) discuss, the ownership of the OH concept cannot be attributed to any singular individual. The origins of OH date back to 340 BC when Hippocrates discussed the impact of environmental factors on human health followed by the recognition of the effect of zoonoses on the public health discussed by Aristotle in 500 BC (Pal, Gebrezabiher, & Rahman, 2014). Toward the latter part of the 20th century, the term One Medicine that has historically captured the connection between human and animal medicine, was broadened to include ecosystem health evolving into OH (Zinsstag, Schelling, Waltner-Toews, & Tanner, 2011). It was Dr. William Karesh who brought formal global recognition to the OH term in the early 21st century working with Ebola in the African continent (Karesh & Cook, 2009).

By and large, the various disciplines of the health professions have established walls that have perpetually deterred collaborative efforts (Hall, 2005). According to Marcotty et al. (2013), IPE is crucial for closing existing gaps in medical and veterinary knowledge which may have implications for animal health, environmental health, and public health. Courtenay, Sweeney, Zielinska, Brown Blake, and La Ragione (2015) express concern that traditional IPE has been concentrated on human health ignoring the role that animal or environmental health (for example, climate change) can have on global health. Previous research from medical educators, such as Rabinowitz et al. (2017), have positioned IPE that incorporates OH as critical for addressing these complicated health threats. Thus, the incorporation of OH in IPE for medical education automatically involves veterinarians as collaborative team members (Kinnison, Guile, & May, 2016).

According to El-Awaisi, Saffouh El Hajj, Joseph, and Diack (2018), certain attributes, such as program of enrolment, age, gender and previous exposure in health care, can determine attitudes to IPE. This study sought to examine whether or not the participation in an MPH enhances the comparative readiness of students for IPE. In order to develop a strategy for developing IPE within the core curricula of the MD and DVM programs, an assessment of student readiness as well as faculty members' opinions for IPE and OH is needed.

As the discussion of previous research presented in the literature review will show, research to date (for example, Talwalkar et al., 2016) has focused on a description of the factors that determine the readiness of medical students for IPE. However, there is no known previous study that has simultaneously evaluated the comparative readiness of DVM, MD and dual degree students for IPE. The literature on IPE initiatives, which include the principles of OH for medicine and veterinary medicine globally, is sparse but expanding in occurrence. These unique efforts are described in greater detail in the next chapter. Surprisingly, very little attention has been paid to investigating the factors influencing faculty attitudes to IPE, which is crucial for developing IPE that includes the principles of OH. These latter gaps in the literature, coupled with my professional role as an educational practitioner at the institution, establish the platform for this study.

1.2. Location of the Study

According to Altbach and Knight (2007), the knowledge-based economies, which have emerged as a result of globalization, have produced a highly competitive market for Higher Education institutions (HEI). Ferreira, Vidal, and Vieira (2014) explain that attracting student applicants requires HEI's to produce quality assured and accredited programs. The Swedish Development Advisers (2004), in their report on Offshore Education, discuss that private for-profit HEIs located offshore in the Caribbean are unique medical institutions. These HEI's cater to a demand for medical education in the US and Canada that exceeds supply, and are dependent on revenue generation obtained from student recruitment to ensure their sustainability. Students of these HEIs largely return to the United States (US) to practice as qualified physicians and veterinarians and this has implications for tailoring institutional programs to meet the demands of the US workforce.

The institution offers the preclinical foundation to the MD and DVM programs with all of the MD and the majority of the DVM students completing their clinical years at affiliated schools in the US. Few DVM students choose to conduct their clinical rotations in Canada, Australia or the UK. The SOM is the largest recruiter of students for the University with a current enrolment as of 2019 of 5,889 students compared to 776 in the DVM. Thus, it is clear that the SOM is the key revenue generator for this institution. The University also offers programs such as the Master of Business Administration and Bachelor's programs such as the Bachelor of Science (BSc) within its School of Arts and Sciences. The institution, as of 2018, offers a general nursing program within its School of Arts and Sciences. The latter program caters to students that intend to obtain licensure to practice within the Caribbean Community and is not as yet internationally accredited. Much of the literature pertaining to studies that utilise the Readiness for Interprofessional Learning Scale (RIPLS) are focused on students from Medicine and the allied human health professions. The University where this research was conducted, does not currently offer programs in many of these allied human health programs such as dentistry, pharmacy, occupational health, osteopathic medicine, optometry, physiotherapy, as its focus has traditionally been on catering to the demand for entry into the MD program.

The accreditation agency for medicine, the Liaison Committee on Medical Education (LCME, 2016), describes IPE as a key standard but the LCME is responsible for accrediting medical schools on the US mainland, not offshore institutions, such as the one in this study. OH is not a requirement for the LCME. The institution, as a foreign medical school, is

accredited by the US National Committee of Foreign Medical Education and Accreditation (NCFMEA). The NCFMEA ensures standards met are similar but they are not identical to those of the LCME (Swedish Development Advisers, 2004). Thus, neither IPE nor OH is a mandatory requirement for the MD program at the institution where this research is conducted.

The UK is not the location of this study but a few of the students at the institution where this research is conducted, elect to conduct their clinical year in the UK. In the UK, the General Medical Council (GMC) requires that medical students have exposure to IPE through working with social workers and other allied health professionals (GMC, 2015). This occurs both at the undergraduate as well as postgraduate levels. The Academy of Royal Medical Colleges (ARMC, 2016) also recommends IPE as a growing field that is crucial for optimising patient care through quality improvement efforts in medical curricula. As Reid, Fielden, Holt, MacLean, and Quinton (2018) and some UK websites explain (Keele University, Faculty of Medicine and Health Sciences, 2019), the higher profile that IPE now holds within the UK may have been influenced by the Francis Report. The outcomes of the Francis report into the Mid-Staffordshire Foundation Trust highlighted the failures of patient care arising from poor communication and team working (Francis, 2013).

The institution's MPH program is accredited by the U.S. Council on Education for Public Health (CEPH, 2016) which, alongside its requirement for the occurrence of interprofessional learning, mandates the incorporation of OH within the curricula of the MPH program. Accrediting agencies for veterinary medicine, such as the American Veterinary Medical Association (AVMA) which has accredited the DVM program for the SVM, recommend but do not mandate the incorporation of IPE within the core curricula of the DVM program (AVMA, 2018). Although OH is not a stated requirement of the AVMA standards for accreditation, the concept is accepted as fundamental to any DVM curriculum. According to the AVMA standard 7.9, the curriculum must provide "instruction in the principles of epidemiology, zoonoses, food safety, the interrelationship of animals and the environment, and the contribution of the veterinarian to the overall public and professional healthcare team" (AVMA, 2018, p. 22). These areas are all fundamental to OH. Despite the programmatic differences in the accreditation requirements for IPE and OH, the institution claims to support the OH philosophy. In the UK, the Royal College of Veterinary Surgeons (RCVS, 2017), which accredits the DVM programs, does not require IPE. The RCVS does not specify the need for OH but as with the AVMA expects students to be competent in the areas pertaining to OH, for example, zoonoses prevention.

This study seeks to utilize its findings to create a vision for the University to execute its claim for supporting OH in the curriculum of its MD and DVM programmes. This is, of course, based on the premise that increasing awareness and understanding of the concept of OH via the platform of IPE is an effective way of preparing practitioners for this role. This will be further explored in Chapter 2.

1.3. Practitioner-based problem

The impetus for the choice of this study topic pertains to my practitioner role as a public health educator. I am an Associate Professor at this institution where my key role is to prepare DVM students for their responsibilities for protecting the public health. The latter translates into preparing our future DVM graduates for protecting their clients, staff and themselves from diseases transmissible to them from the animals they encounter in practice. I, also, hold an adjunct faculty position within the DPHPM in the SOM, where I am involved in advising the dual degree DVM MPH students.

IPE that includes the principles of OH are not currently in place for our single degree MD and DVM students. This study sought to ascertain how these initiatives including IPE could be developed for our single degree students. In order to do this, the study sought to determine whether the exposure of our dual degree students to IPE, which includes OH through the MPH, increases their readiness for IPE and, by extension, collaborative practice compared to our single degree students. It is not the task of this thesis to examine the pedagogical design of IPE that includes OH or to evaluate its implementation.

1.4. Purpose Statement

The specific aims of this study were to obtain a comprehensive perspective on the readiness of students and the perspectives of the faculty and administrators for informing strategies for developing IPE that includes the principles of OH at the institution where this research was conducted. A Mixed Methods Research (MMR) approach was chosen to achieve the aims of this research (Creswell & Plano Clark, 2017).

A validated scale, the Readiness for Interprofessional learning Scale (RIPLS) originally developed by Parsell and Bligh (1999), was used to determine the comparative

readiness of students across programs for IPE. Parsell and Bligh (1999) did not define readiness instead they recommended that the scale be used to evaluate the differences in the perception and attitudes of students towards IPE. The items within the RIPLS enable student readiness for IPE to be measured by an assessment of their attitudes to teamwork, perceptions of their roles and their professional identity (Parsell & Bligh, 1999).

A survey was constructed which included RIPLS, some questions measuring socio-demographic background characteristics of the respondents, their prior public health experience and familiarity with OH as well as two additional questions on the concept and relevance of OH to practice. The survey phase was followed by a qualitative phase involving the use of faculty focus groups and an interview with one of the senior administrators of the SOM to assess the factors influencing student readiness for IPE. This is discussed in the Methodology Chapter. The findings from both phases of the study will be integrated to provide recommendations for developing globally relevant curricula for the MD and DVM programs through the incorporation of IPE that includes the principles of OH at the institution.

The aims of the study were addressed by the research questions described below:

1. What are the differences in readiness scores for (IPE) in the curricula between the medical, veterinary and dual degree programmes?
2. How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?
3. What is the perception of the faculty regarding the factors that influence student readiness for Interprofessional Education (IPE) as demonstrated by the results of the Readiness for Interprofessional Learning Scale (RIPLS)?
4. What do faculty perceive as the opportunities and obstacles to developing Interprofessional Education (IPE) programs for producing globally competent health professionals?

The research will inform the development of a proposed vision for the institution to execute its claim that it supports the OH philosophy.

1.5. Organisation of the Study

Chapter 1 introduced the thesis. It outlined the background and purpose of the study, its relevance within the practitioner setting as well as within the international literature. It also identified the study aims, the research questions and introduced the research site. Chapter 2 provides a literature review that summarizes and critiques the current literature as it pertains to the study topic. Chapter 3 describes the philosophical foundations for the research study, the rationale for the use of the MMR design to conduct the study and the methods used to answer the research questions. Chapter 4 presents the study findings that conveys how the choice of the MMR approach was used to interpret the findings and infer significance. Chapter 5 forms the discussion of the findings underpinned by the analytical lenses of specific theoretical frameworks. The study concludes with Chapter 6 providing recommendations for addressing the practitioner issue at this institution. The importance and originality of the study are that it explores the factors that influence the readiness of students across four different health professional groups for IPE that incorporates a OH philosophy. The study also provides new insights into faculty perspectives across multiple programs for developing IPE that includes the principles of OH at a medical institution.

Chapter 2: Literature Review

The review begins with a description of the search criteria used for identification and analysis of the literature pertinent to this study. This Chapter draws upon the principles of the interactive literature review process (ILRP) described by Combs, Bustamente, and Onwuegbuzie (2010). This is followed by a critical review of the key bodies of the literature that are germane to this research. The components of this review include the following key sections: (2.2) One Health (OH), (2.3) Interprofessional Education (IPE) (2.4) Student Readiness for IPE and OH and faculty attitudes to IPE and (2.5) the theoretical frameworks that underpin this study. A brief summary of the literature will conclude this Chapter.

2.1. Search Criteria for Selection of the Literature

A thorough and strategic search of the literature was conducted across various search engines as depicted in Table 1 below.

Table 1

Literature Search Strategy

Strategies	Key Words and Sources
Key search terms used along with various Boolean operators, truncated terms, specific authors and citation tracking	"One Health" AND "Interprofessional Education"; "One Health" AND "IPE"; "One Health" AND "medical" AND "student" "One Health" AND "veterinary" And "Interprofessional" AND "education" "Readiness" AND "student" AND "Interprofessional" AND "education" "faculty" AND "Interprofessional" AND "education" AND "attitudes" "One Health "AND "concept" OR "Approach" "student readiness" AND "interprofessional" AND "learning" OR "education", "student " AND "One Health" AND "concept" OR "Approach", "Differences in readiness" AND "Interprofessional", "Readiness for interprofessional learning" AND "healthcare disciplines", "Readiness for interprofessional learning" AND "veterinary" and "Dual degree" "Faculty" AND "readiness" AND "Interprofessional education".
Databases searched	All relevant databases for the topic area: Scopus, CAB, google scholar, abstracts, Web of Science, PubMed, Medline and Science Direct, Cochrane Library (CENTRAL), CINAHL, EBSCO and EMBASE.
Websites of international Interprofessional (IP) organisations searched	Australasian Interprofessional Practice and Education Network (AIPPEN), 2019); Canadian Interprofessional Health Collaborative (CIHC) (Interprofessional Global, 2019); Centre for the Advancement of Interprofessional Education (CAIPE), (2019); European Interprofessional Practice and Education Network (EIPEN), (2019); and the Nordic Interprofessional Network (NIPNET)
Other resources related to One Health	Books dedicated to the topic of One Health and within specific One Health websites: Caribbean Animal Health Network (CaribVet) (Cirad-Agricultural Research for Development, 2009-2019); One Health Commission (2019); University of Southern California Libraries (USCL), 2019).
Years of search	All years up to and including 2019
Types of studies to be included	Quantitative studies, qualitative studies, Mixed Methods Research studies and reviews

The term "veterinary" was not found within the websites of the CIHC, (2019); CAIPE, (2019); EIPEN, (2019); or NIPNET, (2019).Veterinarians are not mentioned within many reports involving IPE such as *Advancing Interprofessional Clinical Prevention and Population Health Education a Curriculum Development Guide for Health Professions Faculty* produced by the Association for Prevention Teaching and Research (APTR, 2015).The latter resource lists nursing, pharmacy and Allied health professions within their guide with no mention of veterinary or environmental health faculty. In the 13th Annual Report to the Secretary of the United States Department of Health and Human Services on *Transforming Interprofessional Health Education and Practice*: *Moving Learners from the Campus to the Community to Improve Population Health*, the Advisory Committee on Interdisciplinary, Community-Based Linkages (ACICBL, 2014) neglects to consider the role of the veterinarian.

The recognition that uniprofessional approaches to complex health issues has been insufficient is realized by the establishment of the Interprofessional Education Collaborative (IPEC, 2019). Initially, IPEC consisted of just 6 health related professions and now includes veterinary medicine with the representation of the Association of American Veterinary Medical Colleges (AAVMC), (IPEC, 2019). The report produced by the WHO (2010), *Framework for Action on Interprofessional Education and Collaborative Practice,* does include veterinarians as a core collaborator in IPE. A workshop held in 2014 by the Institute of Medicine (IOM) Global Forum on Innovation for the Health Professions brought 59 different groups including the AAVMC together to discuss how interprofessional collaboration could be fostered. The latter was summarized in the report produced by the National Academies of Science, Engineering and Medicine (NASEM), *Establishing Transdisciplinary Professionalism for Improving Health Outcomes* (Institute of Medicine, 2014).

A search within the National Center for Interprofessional Practice and Education (NCIPE, 2019a) mentioned 4 instances of veterinary inclusion efforts by small groups to conduct case-based IPE classroom exercises involving veterinarians alongside human health professionals. The Interprofessional Professionalism Collaborative (IPC, 2019), created in 2006, included the AAVMC as one of their collaborators in 2009. A list of IPE programs in the US are listed in the American Interprofessional Health Collaborative website (AIHC, 2018). Searches within these programs revealed that few included Veterinary faculty and/or students.

During the search procedure it became evident that the literature has a one-sided focus on the topics and that references to veterinarians are scarce. Ongoing searches of the literature have been conducted to identify articles providing new insight into the topic of student readiness for IPE and faculty perspectives on developing IPE that incorporates the principles of OH. This study seeks to determine the readiness of MD and DVM students for IPE that familiarises students with the principles of OH and thus the conceptual framework of OH will now be discussed.

2.2. One Health (OH)

Given the importance of the OH philosophy worldwide, the following section will critically explore the concept of OH. This section begins with a window into the historical origins of OH, the current global definitions of the concept, its relevance to global health and policy culminating in the importance of OH in addressing gaps in medical education.

2.2.1. The Origins of One Medicine and One Health (OH)

The essence of One Medicine was first described by the German physician Rudolf Virchow (1821-1902) who declared "between animal and human medicine there is no dividing line, nor should there be" (Chaddock, 2012, p. 241). The term One Medicine was earlier coined by Sir William Osler, a physician and student of Virchow, who taught both at the McGill University medical school and at the veterinary school in Montreal (Chaddock, 2012). In 1984, Calvin Schwabe (1927-2006) revived the concept of One Medicine emphasizing the similarities between the disciplines of medicine and veterinary medicine and the implications this has for promoting mutual collaboration (Zinsstag et al., 2011).

In the late 20th century, the term One Medicine was broadened to include ecosystem health with human and animal health evolving into OH (Zinsstag et al., 2011). As Chaddock (2012) discusses, regardless of which term is used, the fundamental ideology of OH remains the same, it is a "behavioural and cultural concept" (p. 241) that provides a framework for interdisciplinary collaboration.

2.2.2. Defining One Health

It is now well established that OH represents not just the inclusion of zoonoses and environmental factors on human health but many other areas including the impact of the

animal-human bond on human mental health (Day, 2016; Hodgson & Darling, 2011). Lessons to be learned through collaborations in translational medicine have implications for advancements in human medicine (Rabinowitz et al., 2017). All of these areas are included within the umbrella of OH as shown in Figure 2 (One Health Initiative, n.d.).

Figure 2. This image depicts the Umbrella of One Health.
Note: Reproduced from About the One Health Initiative by One Health Sweden in collaboration with One Health Initiative. Retrieved from http://www.onehealthinitiative.com/about.php. Copyright by One Health Initiative. Reprinted with permission.

The OH concept became increasingly more important following the emergence of SARS (2003) and then Highly Pathogenic Avian Influenza (H5N1) in 2005 (Valeix, 2018). Over the years, OH has been defined in multiple ways (Xie, Liu, Anderson, Liu, & Gray, 2017).

According to Mersha and Tewodros (2012), OH represents a “paradigm” (p. 239) shift moving away from a focus on individual health towards a population level approach for

tackling health issues. In contrast to Mersha and Tewodros (2012), Degeling et al., (2017) define OH as representing the interdisciplinary integration of expertise across the sectors of animal, human and environmental health. A broader perspective is provided by Rabinowitz et al. (2017) and Mardones et al. (2017) who define it as a transdisciplinary approach that expands on the breadth of disciplines that should frame such collaborations for attending to health issues. Similarly, the AVMA taskforce (AVMA, 2008) defines OH as "the collaborative effort of multiple disciplines working locally, nationally and globally to attain the optimal health for people, animals and our environment" (p. 4). The US Federal Agency, The Centers for Disease Control and Prevention (CDC) has also called for this type of collaboration between the health disciplines at national, local and international levels in order for the goal of optimal health for all species to be attained (CDC, 2019).

Destoumieux-Garzón et al. (2018) explains that there is insufficient address of the environmental component and its effect on disease emergence within the definition of OH. Briefly, this issue was addressed by the development of the 12 Manhattan principles which arose from the conference held by the Wildlife Conservation Society (WCS, 2015-2019) in New York in 2004. These principles draw focus to the need for governments and the private and public sector to seek to preserve biodiversity, encourage conservation and preserve wildlife health (Buttigieg, 2015).

The WHO defines health as "the state of complete physical, mental and social well-being and not merely the absence of disease" (WHO, 2019a, p. 1). According to Lerner (2019), the challenges to creating a scientific theory, which guides the goals and approaches of OH, represent more than the WHO definition of health. Research to date has failed to articulate what the ultimate and final objectives are in defining the features of optimal health for all species that the OH approach seeks to achieve. Defining the features of optimal health for all species is crucial for the formulation of a scientific theory capable of guiding the successful execution of One Health to practice. Van Herten, Bovenkerk, and Verweij (2019) propose that the other issue in executing OH is an ethical one. Van Herten et al. (2019) argue that OH should not only be about how the health of animals and the environment impact human health but should consider the importance of the health of animals and the environment independently of their impact on human health.

Berthe et al. (2018) broaden the applicability of OH as a framework for strengthening public health systems across the health sectors for operationalizing collaboration between medical practitioners, veterinary surgeons and environmental health professionals. Salyer, Silver, Simone, and Barton Behravesh (2017) recommend the framework of OH as providing

an approach for multisectoral collaboration that is crucial for attending to the key threats to global health. In order to drive health policy changes that support the execution of the OH approach, students must understand the relevance of OH to practice. In the next section the relevance of OH to global health and policy formation will be discussed.

2.2.3. The relevance of OH to global health and health policy

This study sought to determine the student's understanding of the concept of OH and its relevance to health practice. This is fundamental for promoting collaborative practice and preparing our graduates to become involved in health policy development. Shomaker, Green, and Yandow (2013) discuss that the historical obstacles that have existed must be dissolved to facilitate knowledge transfer and enable future graduates of the health professions to collaborate. Spencer et al. (2019) support this view arguing that one method of promoting collaboration is through the early introduction of IPE, which includes the principles of OH to students.

The WHO lists zoonoses and antimicrobial resistance in humans and animals amongst the top 10 threats to global health (WHO, 2019b). The current linear approach to addressing health issues has failed to stem the occurrence of these complex problems. According to Rüegg et al. (2017), this is due to the failure to understand the effect of social factors (poverty, inadequate public health systems) and environmental factors (climate change, biodiversity loss, urbanization) promulgating the occurrence of these health threats. This view is supported by the Academy that recommends the use of the OH approach for preventing and responding to outbreaks that occur at the boundary of human and animal health (NASEM, 2017). The latter would result in considerably reduced expenditure to world economies.

The United Nations Sustainable Development Goal (SDG) no. 3 of the 2030 agenda is designed to address the multiple challenges facing global health (United Nations, 2019). Barrett, Bouley, Stoertz, and Stoertz (2011) and Connolly (2017) argue that these goals require changes to the way in which health policy is developed. The multifactorial complex causes of health challenges require that policies be informed by the expertise of those within the social, medical, veterinary (Herrmann, Johnson, Troutt, & Prudhomme, 2009) and environmental health professions (Connolly, 2017). Salyer, et al. (2017) suggest that OH provides a framework for policy makers to collaborate with these groups in formulating policies that attend to zoonoses elimination, a key item on the Global Health Security Agenda

(GHSA, 2019). The greatest challenge to operationalizing OH, despite the recommendations by international agencies for supporting it, is a lack of familiarity with OH by human health professionals (Farag et al., 2019).

Hollier, Quinn, and Brown (2018) argue that veterinarians and physicians can no longer afford to focus on their narrow perspective on disease occurrence, but must now adopt a "global lens" (p. 38) to intercept disease transmission across global borders. The OH conceptual framework provides such an approach for operationalizing interdisciplinary collaboration across these three key health sectors (Rüegg et al., 2017). Widening the perspective of future physicians and veterinarians requires that gaps in the curricula of each discipline be addressed as discussed in the section that follows.

2.2.4. One Health to address gaps in medical and veterinary education.

This study was informed by the perspectives of others, such as Togami et al. (2018), who proposed that the incorporation of the principles of OH in health professions curricula as a core competency would promote collaborative practice. In the same vein, the One Health Initiative Task Force (OHITF) report emphasized the need for integrating education across medical, veterinary and public health programs with a view to promoting interdisciplinary collaboration (King et al., 2008). Similarly, Jasani (2018) gives emphasis to the historical recognition by MDs, such as Virchow and Hippocrates, that physicians must adopt a transdisciplinary approach for enabling the advancement of medicine as advocated by OH. The latter perspectives from the literature informed the incorporation of the open- ended questions on OH in this study to determine the students' understanding of the concept and its relevance to practice.

According to Queenan et al. (2017), stakeholders within government and academia must be educated about OH issues if they are to promote its addition to policy frameworks. This view is supported by Courtenay et al. (2014) and King et al. (2008) who argue that shared education for physicians and veterinarians will promote dissolution of the siloes that deter interdisciplinary collaboration. Expanding on this view, Kahn, Kaplan, Monath, and Steele (2008) discuss education as crucial for addressing the insufficiency of the zoonotic and environmental content in medical education which can lead to patient misdiagnosis. Similar points have been raised by Chapman and Gupta (2019); Machalaba et al. (2017); and Rabinowitz et al. (2017).

Rabinowitz et al. (2017) suggest that OH competencies should include the development of team competency and communication skills to enable interprofessional collaboration. According to Rabinowitz et al. (2017), equally important competencies for inclusion are the bond shared between humans and companion animals and the effect of environmental factors and foodborne diseases of animal origin on health. According to Marcotty et al. (2013), the following two curricula gaps needed to be addressed: Doctor of Medicine (MD) students' recognition of the effect of zoonoses on the health of their patients, and Doctor of Veterinary Medicine (DVM) students' awareness of the effect of human social and behavioural factors on epidemic occurrences. Chaddock (2012) is more concerned that both medical and veterinary curricula have gaps in environmental health education. In the same vein, Stephen (2009) expresses concern on the absence of veterinary curriculum content on ecosystem health pertaining to knowledge about the social and ecological factors that can impact health.

A huge gap exists in the appreciation of the role of the veterinarian by other health professionals as an important player in minimizing zoonotic threats (Valeix, 2018). Similarly, Englar, Show-Ridgeway, Noah, Appelt, and Kosinki (2018) discuss the lack of recognition by physicians on the veterinarian's key role in public health specifically as it pertains to zoonoses prevention. According to Englar et al. (2018), similar gaps in knowledge exist about veterinary student perceptions on the role of physicians. A mutual understanding of the role of each sister profession is essential for promoting practice collaboration. A broader perspective is provided by Craddock and Hinchcliffe (2015) and Nielsen and Eyre (2017) who recommend that veterinary curricula incorporate social sciences content to equip veterinarians to consider the social and cultural factors that can effect zoonoses emergence.

Allen (2015); Damborg et al., (2016); and Englar et al. (2018) explain that the physician often fails to contemplate zoonoses on their list of differential diagnoses for their patients. The latter scenario is exacerbated by the reluctance of both doctors and veterinarians to communicate on issues that pose considerable threat to the public health. Yet, in my own experience with medical practitioners, there are large gaps in the knowledge of both as has been reported elsewhere (Hennenfent, Iyengar, & Davies-Cole, 2018). The evidence presented in this section combined with Chaddock (2012) and Eiras et al. (2016) recommend the need for enhancing the knowledge of the medical practitioner on zoonoses through education.

Although OH is widely recommended for incorporation within accreditation requirements and frameworks for global health policies (National Academies Press, 2017),

this is not currently a reality. Lucey, Sholts, Donaldson, White, and Mitchell (2017) advocate that IPE /OH programs for MD students are essential for coupling the addressing of these gaps with equipping students with the skills required to execute OH in their practice. A broader perspective is provided by Hayes, Engelke, Stielstra, and Kachani, (2014) who suggest that dual degree Master of Public Health (MPH) programs provide a platform for critically evaluating the most successful pedagogical approaches for imparting OH to future medical and veterinary graduates.

In reality, the existence of dual degree programs is sparse, with most occurring at U.S. Universities as reported by Alamri (2018); Andriole, Jeffe, and Tai (2016); and Chauvin, Rodenhauser, Bowdish, and Shenoi (2000). Salehi, Hashemi, Saber and Imanieh (2015) and Manavi, Nedjat, Pasalar, and Majdzadeh (2013) report the occurrence of MD MPH programs at two medical schools in Iran. Zweigenthal, Marquez, and London (2016) report on similar programs in South Africa. In some countries, such as the UK, MSc and MPH programs are offered as a postgraduate option as described in Section 2.3.5. As this study seeks to determine the readiness of MD and DVM students for IPE that includes the principles of OH, the next section will explore how IPE differs from the conceptual framework of OH.

2.3 Interprofessional Education (IPE)

IPE differs from OH in the way it is defined. This differentiation is discussed in Section 2.3.2. This section will present the definitions of IPE and its relevance to global health, distinguish it from OH, discuss the history of its origins and barriers to IPE delivery. This section will also conduct a critical review of IPE and OH programs on the global stage and explore student experiences of IPE.

2.3.1. Definitions and relevance of IPE

IPE aims to promote collaborative learning that facilitates trust, efficient teamwork and communication and an understanding of the role of others in interprofessional teams that enhances patient care (Khajehghyasi, Jafari, & Shahbaznejad, 2017; Wong et al., 2018). Similar views are expressed by Vafadar, Vanaki, and Ebadi (2015) who expand on the benefits of IPE for reducing costs through minimizing medical negligence. Brandt (2015) suggests that, despite these advantages, barriers to developing IPE as discussed in Section 2.3.4. have led to a disconnect between recommendations for its creation and variability in where IPE occurs.

The evidence from the literature that supports IPE as a cause of improved patient care in practice is still scant (Cooper, Carlisle, Gibbs, & Watkins, 2001; Illingworth, & Chelvanayagam, 2017). Yet, Cooper et al. (2001) and Pumar Méndez, Armayor, Diaz Navarlaz, and Wakefield (2008) share the view that the delivery of IPE for undergraduates can reduce negative stereotyping about other professions enabling collaborative practice upon graduation. According to Chapman and Gupta (2019), shared educational opportunities that enable OH education to occur with medical, veterinary and public health students has the advantage of enabling the medical students' readiness for practice.

2.3.2. IPE versus OH

IPE has historically been incorporated in the curriculum of human medicine and its allied professions with a view to enhancing the care of the human patient. Courtenay et al. (2015) express concern that most IPE initiatives focus on care of the human patient to the disregard of the role of the animal or the environment. Wilkes, Conrad, and Winer (2018) draw attention to the fact that OH content includes environmental health (natural disasters, climate change) and animal health creating depth to and, thus, promoting the interprofessional learning experience. Chapman and Gupta (2019) argue that inclusion of OH content within the curriculum may enable medical students to consider the social factors determining health (occupational, hygiene), the effects of climate change on health and improve patient-physician communication.

Tegzes (2017), expanding on the World Health Organisation (WHO) interpretation of IPE, suggests that the term be broadened to include OH ideologies which consider the role of animal health and include the veterinary profession. Similarly, Kinnison and May (2016) discuss that the term interprofessional is often used in terms of the OH context where veterinarians work with professionals from other health related disciplines. Veterinarians assume their role in protecting both human and animal health when they declare their oath (Lindenmayer & Schlaff, 2008). The literature on veterinary involvement with other groups in IPE is rarely reported (Kinnison et al., 2016).

Lindenmayer and Schlaff (2008) argue that just as the veterinarian conducts this dual role, all health professionals should take responsibility for protecting animal and environmental health. According to Marselle et al. (2018), public health education prepares students to recognise the importance of preserving eco-friendly environments and green spaces for optimizing human mental and physical well-being. In this study, the dual degree

students are exposed to this type of content through the MPH program. The curriculum of the MPH at the institution requires students undertake courses in the social, behavioural, cultural and environmental factors that impact the public health.

Courtenay et al. (2015) discuss the need for IPE with its competencies focused on effective teamwork and communication and professional roles as crucial for operationalization of OH in practice. Similar views are shared by Courtenay et al. (2014) and Tegzes (2017). In this study a connection will be made between the concepts of IPE and OH through exploring the students' readiness for IPE and understanding of OH for developing IPE that incorporates OH at the institution where this research was conducted. Having introduced the concept of IPE, we will now review the history of IPE, internationally.

2.3.3. History of IPE internationally

In 1972, the New York based Institute of Medicine (IOM) (now the National Academy of Medicine) responded to the increasing demand for care resulting from legislation providing health insurance to the US population. The IOM published a report: "*Educating for the health team*" that introduced the concept of healthcare teams based on an interdisciplinary approach to medical education (Milstead & Short, 2019). The 1972 report supported the need for IPE for health professions students and provided their definition of the term interdisciplinary: Students from different health professions taught by faculty from one discipline; students in one discipline taught by faculty from a range of disciplines; students from more than one discipline taught by faculty from a range of disciplines (Baldwin, 2007).

Global traction for IPE has evolved from cumulatively complex health occurrences, concerns regarding quality of care and the occurrence of errors in patient care as earlier discussed (Nisbet, Lee, Kumar, Thistlethwaite, & Dunston, 2011). The Lancet Report (Frenk et al., 2010) and the WHO (2010) *Framework for Action on IPE and Collaborative practice* stated that IPE was essential for optimizing health care through collaboration and essential in promoting the inclusion of IPE within medical curricula. IPE inclusion within medical curricula is supported by government and Higher Education medical institutions in four developed countries (Canada, Australia, UK and the USA) (Thistlethwaite et al., 2014). Despite this, barriers to its implementation, discussed in Section 2.3.4, have led to inconsistency in the occurrence of IPE.

2.3.4. Barriers to developing IPE

According to Baldwin (2007), these barriers continue today with the existence of the siloes that exist between the health professions and continue to militate against its execution globally. This view is supported by Brandt, Kitto, and Cervero (2018). Brandt et al. (2018) discuss the complexity presented by IPE that requires various disciplines with their unique professional cultures, particularly medicine, to unite in collaborating to optimize patient care. This study draws on these findings to explore whether there are comparative differences in readiness for IPE across veterinary students, medical students and dual degree students.

A lack of familiarity with what is required for its creation and professional resistance among the core disciplines pose key obstacles (Bennett et al., 2011). Carpenter (1995) argues that having students share classes across disciplinary groups does not translate to an interprofessional learning experience if collaboration between students does not occur. Large class sizes and limited funding are another barrier (Winer, Nakagawa, Conrad, Brown, & Wilkes, 2015). Others include a lack of policy support, cultural differences, gender-linked role stereotypes (Curran, Sharpe, Forristall, & Flynn, 2008), geographical isolation of departments and a lack of standardized assessments of IPE (Talwalkar et al., 2016).

In this study, the shared location of a medical and veterinary school at the institution provides an opportunity for developing IPE. However, the large class sizes in the medical school coupled with a lack of an accreditation requirement for IPE and OH thwarts its development. To advance the development of IPE and OH at this institution, the attitudes of these stakeholders will be explored.

Courtenay et al. (2014) discuss the obstacles to comparatively evaluate the effectiveness of these programs but fail to provide recommendations for improvement of these programs. Conversely, Levett-Jones et al. (2018) provide insight into the successful development and implementation of IPE programs across five countries.

As is relevant to my study, Levett-Jones et al. (2018) discuss the factors that can aid in overcoming barriers to IPE development. According to Levett-Jones et al. (2018), the use of committed faculty who have the expertise to develop innovative approaches is critical for overcoming these barriers to IPE development. Although Levett-Jones et al. (2018) describe IPE initiatives involving members of the human health professions, similar applications of using existing faculty at the institution in this current study are relevant for implementing IPE that includes the principles of OH.

The delivery of virtual and face-face IPE that include the principles of community settings, which involve our veterinary and medical students, can assist in preparing them for

collaborative practice. Previous studies fail to provide guidance on assessment of IPE initiatives. Levett-Jones et al. (2018) challenge the widely held view that it is difficult to develop and execute IPE. Instead, Levett-Jones et al. (2018) offer examples of qualitative and survey methods that have been used to evaluate initiatives which have been successfully developed and implemented on the world stage. In the next section, the diversity of IPE and OH programs offered globally will be explored.

2.3.5. IPE and OH programs

The literature has highlighted IPE programs that exist globally with most reported in the UK and US. Courtenay et al. (2014) provide an expansive review of IPE interventions that exist across institutions. None of these report IPE that promote OH. This may explain the reported continued failure of students to grasp the benefit of these collaborative initiatives (Courtenay et al., 2014).

This current study has predominantly recruited students in the undergraduate MD and DVM programs similar to those that were enrolled in the IPE programs discussed in this literature review. According to Pumar Méndez et al. (2008), the benefits of undergraduate IPE is the effect it can have on eliminating the development of negative stereotypes and perceptions about other professional groups early in the student's professional life. Conversely, other authors, such as Lindqvist et al. (2019) suggest that students would not yet have a fully formed professional identity and would not benefit from IPE.

Most of the IPE interventions reviewed by Courtenay et al. (2014) were focused on human patients failing to mention the advantages of these programs to animal or environmental health. Courtenay et al. (2014) and Thistlethwaite et al. (2014) share the view that variation in how courses are designed worldwide and the paucity of those reporting outcome measures, required to assess the benefits of IPE, reveal the inconsistency that occurs in IPE initiatives.

The range of IPE offered globally and discussed by Courtenay et al. (2014) varied between undergraduate programs for MD and DVM students at Texas A & M (Edwards et al., 2004) and postgraduate programs as the MPH at the University of Wisconsin-Madison (UWM) (Olsen & Remington, 2008). The programs reviewed by Courtenay et al. (2014) ranged from short practicums at the University of Illinois (Herrmann et al., 2009) to single sessions at Texas (Edwards et al., 2004). The objectives were different in all of these cases, ranging from assisting students to meet targeted IPE competencies (University of Minnesota,

2013) to simply promoting collaborative practice (Western University of Health Sciences, 2013).

The institution where this study is conducted provides a less common occurrence of exposure to IPE that incorporates OH in its dual degree MPH offerings. As earlier discussed, the lack of a mandate for IPE and OH for the MD program poses a challenge to design IPE for the MD students alongside DVM students. This is supported by Davies (2002) who states that, historically, the medical profession has remained averse to altering their professional status. Pumar Méndez et al. (2008) suggest this may be why many IPE and OH initiatives are offered at the postgraduate level. According to Pumar Méndez et al. (2008), graduates that have already obtained clinical practical experience may be better able to appreciate the advantages of IPE at the postgraduate level.

Courtenay et al. (2014) discuss that many postgraduate programs focused on OH independent of IPE including those outside of the US, such as that offered at University of Angers (2013) in France. Table 2 below depicts those offered at the Royal Veterinary College, University of London (RVC, 2013), Royal Dick at Edinburgh University (RDSVS, 2013) in the UK and reviewed by Courtenay et al. (2014). Postgraduate programs, such as the MPH that include OH, are offered to DVM and MD graduates at the University of California-Davis (Hird et al., 2008), University of Wisconsin-Madison (Olsen & Remington, 2008) and Tufts University (Lindenmayer & Schlaff, 2008) in the US as discussed by Courtenay et al. (2014).

Other examples found in the literature are shown in Table 2. A diversity of OH initiatives exists globally (as shown in the Table 2), ranging from case-based sessions, to Master of Science (MSc) Programs and online Massive Open Online courses (MOOCs). There is a clear lack of uniformity across programs, in terms of expected outcomes, making it difficult to assess the effectiveness of these programs. According to Togami et al. (2018), there is a lack of core competency expectations both content-based (antimicrobial resistance, socio-economic and environmental drivers of emerging diseases) and professionalism-based (the ability to communicate with audiences consisting of multiple disciplines including policy makers) in many OH programs.

A few institutions are beginning to offer OH programs in the MD and DVM undergraduate curricula that can be described as IPE (for example, Uehlinger, Freeman, & Waldner, 2018; Wilkes et al., 2018) shown in Table 2. According to Eyre (2015), there is a clear need for wider incorporation of OH within undergraduate medical and veterinary curricula.

Table 2

One Health programs

Authors and Institution	OH program	Students
University of Saskatchewan (Uehlinger et al., 2018)	OH leadership experience	health sciences students including DVM and MD
Wilkes et al. (2018) in the US	OH case-based problems on (zoonoses, climate food safety)	DVM and MD
Royal Dick School of Veterinary Studies (RDSVS, 2013), Edinburgh, UK.	MSc OH	Graduate students
RVC (2013)	MSc OH	Graduate students
Massey University (2019), New Zealand	MSc OH	Graduate students
University of Calgary in Canada (Cribb & Buntain, 2009)	OH in DVM curricula	DVM students
University of Geneva (De Castañeda et al., 2018); University of Basel (n.d)	Massive Open Online Courses (MOOCs)	Students and other interested individuals
University of California-Davis , University of Washington, Duke University, Ohio State University, University of Florida-Gainsville and Tuskegee University in the US (Aguirre et al., 2016)	Research and educational initiatives	Range of students

Several authors, such as Hayes et al. (2014) and Stroud, Kaplan, Logan, and Gray (2016), argue that institutions which offer dual degree DVM MPH and MD MPH programs provide an arena for delivering OH to future graduates. This view is supported by Lindenmayer and Schlaff (2008) and Herrmann et al. (2009). Conversely, Barrett et al. (2011) argue that, if the gaps in medical and veterinary curricula are to be addressed, collaboration should occur within core degree programs and not rely on dual degree programs, only, for OH. This section has explored the variety of IPE and OH programs that exist internationally. In the next section, the experiences of students who have gone through IPE initiatives will be discussed.

2.3.6. Student experiences of IPE and OH

Edwards et al. (2004) and Winer et al. (2015) explain that shared medical and veterinary educational efforts are sparse. Twelve papers were found that discussed student experiences of IPE. The few published papers that discussed IPE, which includes OH for MD

and DVM students at US institutions, report the encouraging feedback students'obtained from these experiences (for example, Edwards et al., 2004; Hendrix, McClelland, Thompson, Maccabe, & Hendrix, 2005; Wilkes et al., 2018; Uehlinger et al., 2018; Winer et al., 2015). According to Winer at al. (2015), the majority of medical and veterinary students reported that they had learned a greater appreciation of the importance of the skills of the other groups following an IPE intervention and felt that OH should be incorporated in their curriculum. Similarly, Wilkes et al. (2018) reported positive experiences by medical and veterinary students and faculty who participated in IPE, which included the principles of OH, recounting an expansion of their knowledge about IPE and OH. This evidence is supported by Mahler, Schwarzbeck, Mink, and Goetz (2018).

Uehlinger et al. (2018) conducted a post-survey assessment of student experiences on their leadership program in OH and reported an overall positive response by students towards the importance of interprofessional collaborations. In the 5-year survey post-event, 90% of participants said they interacted more with students from the other health sciences; 81% that OH should be included in their program, while 80% expected to incorporate the OH approach in practice. Interestingly, nursing, pharmacy and medical students linked abuse of animals and domestic abuse and welcomed collaborations between veterinarians and social workers (Uehlinger et al., 2018). Evrony (2016), a medical student, made it explicit that her work with zoo veterinarians led to her gaining a greater understanding about human diseases by exposure to the comparative aspect of veterinary medicine.

Positive experiences of IPE promotes the students' readiness for shared learning. This study seeks to determine the readiness of students for IPE that includes OH and faculty attitudes about the strengths and weaknesses of developing these initiatives. Hence, the literature pertaining to these areas is critically reviewed in the next section.

2.4. Student Readiness for IPE and Faculty Attitudes to IPE

Lestari, Stalmeijer, Widyandana, and Scherpbier (2016) suggest that in order to develop IPE, it is crucial to determine the readiness of students for interprofessional learning.

2.4.1. Student readiness for IPE.

Most studies on readiness for IPE have been conducted in developed countries with the UK, Canada, Australia and Japan having the strongest representation of IPE (Shankar, Dwivedi, Nandy, & Balasubramanium, 2015) and fewer programs in the US (Hertweck et al.,

2012). Visser, Ket, Croiset, and Kusurkar (2017) reviewed the attitudes of medical, nursing and medical residents in clinical settings to IPE. They found that, across quantitative, qualitative and Mixed Methods Research (MMR) studies, attitudes were influenced by curriculum (poor delivery and evaluation approaches), individual (perceptions of prejudice by other professional groups) and cultural/ institutional (limited interaction encouraged between nurses and doctors) factors. Importantly, regardless of geographical context, authors (for example, De Oliveira et al. 2018; Horsburgh, Lamdin, & Williamson, 2001; Keshtkaran, Sharif, & Rambod, 2014) discussed the disinclination of MD students in comparison to other allied health groups towards participation in IPE.

2.4.2 Measuring student readiness for IPE

Both quantitative and qualitative methods have been used to measure student and faculty readiness for IPE. Surveys have been used predominantly but qualitative methods that include interviews and focus groups are also described, with fewer using MMR designs. Literature outcomes, presented in the following sections, were reviewed in order to determine the adequate methodologies and methods for my own empirical study.

2.4.2.1 Quantitative methods of measurement for student readiness for IPE

Reeves and Barr (2016) have reviewed a number of scales for evaluating IPE, recommending the Kirkpatrick's six-point framework for evaluating the outcomes of IPE. Wall (2010) discusses the use of the Kirkpatrick framework ranging from outcomes that measure the student's opinion on an IPE exposure to measurable patient improvement. Some commonly used scales are described in Table 3, but this list is not exhaustive with several others being described by the National Center for Interprofessional Practice and Education (2019b). These scales have been developed precisely for, and used extensively by, members of the human health professional groups.

Table 3

Measurement tools used to evaluate IPE

Tools	Uses	References
Interdisciplinary Education Perception Scale (IEPS)	Changes in students' attitudes before and after IPE interventions	Maharajan et al. (2017); Rajiah et al. (2016)
The Jefferson Scale of Attitudes towards Interprofessional Collaboration (JeffSATIC)	Measure student attitudes to IPE	Hojat et al. (2015; Shankar et al. (2015)
Attitudes towards Healthcare Team Scale (ATHCTS)	Measurement of attitudes to working in interprofessional teams	Wong et al. (2018), Groessl and Vandenhouten (2019)
Readiness for Interprofessional learning Scale (RIPLS) https://nexusipe.org/informing/resource-center/ripls-readiness-interprofessional-learning-scale	To determine student's readiness for IPE as well as measure a change in attitudes to IPE pre and post IPE interventions	De Oliveira et al. (2018), Lestari et al. (2016)

Havyer et al. (2016) reported that the American Association of Medical Colleges (AAMC) includes interprofessional collaborative practice as one of the core competencies required of the medical graduate. A review of appropriate tools for assessing the AAMC's IPE competencies, based on measurement validity and Kirkpatrick's categorization (Wall, 2010) of outcomes assessments, recommended the following four (of 64 reviewed): The RIPLS; the Collaborative Health care; Interdisciplinary Relationship Planning, Communication; and Teamwork skills assessment and Teamwork miniclinical evaluation exercise (Havyer et al., 2016). Guinan et al. (2018), using the Kirkpatrick's model (Wall, 2010) to evaluate outcomes of an IPE intervention, demonstrate that exposure to IPE can positively transform student attitudes to interprofessional learning. Both the Readiness for Interprofessional learning Scale (RIPLS) and the Interdisciplinary Education Perception Scale (IEPS) surveys, listed in Table 3, are commonly used within the health professions to assess student perceptions of and readiness for IPE (Rajiah et al., 2016; Stull & Blue, 2016; Wong et al., 2016). While the RIPLS evaluates students' individual attitude to interprofessional learning, the IEPS differentiates student perceptions about their own professional group in relation to other professional groups (Lie, Fung, Trial, & Lohenry, 2013).

As is relevant to this study, the RIPLS is particularly useful for assessing student readiness before instituting IPE. According to Mahler, Berger, and Reeves (2015), a lack of clarity exists regarding its validity to detect attitudinal changes after IPE has been instituted. Thus, RIPLS may be more of an exploratory tool for assessing student perceptions about IPE. Only one study could be found that describes the use of the RIPLS in DVM students with no other professional groups included in the study. Kinnison et al. (2011) discuss the use of the RIPLS for demonstrating the potential beneficial effects of IPE exposure for veterinary students and veterinary nursing students with implications for their collaboration as a team in veterinary practice. Only two studies involved DVM students alongside other human health professional groups: One by Hoffman and Redman-Bentley (2012) using the Interprofessional Attitudes Questionnaire (IAQ) for measuring IPE readiness. The second by Stull and Blue (2016) used the RIPLS and IEPS to measure attitudes to IPE.

In this study, the decision to use the RIPLS was threefold: (1) The instrument has been validated several times since it was developed by Parsell and Bligh (1999) in the undergraduate context; (2) This study sought to assess readiness prior to developing IPE; (3) the RIPLS is the most frequently used tool in studies that seek to evaluate readiness for IPE in the literature. Among authors who use the RIPLS are: De Oliveira et al. (2018) in Brazil; Lestari et al. (2016); Maharajan et al. (2017) in Malaysia; Ong, Tan, Knab, Farrell, and Lim (2017) in Singapore; Talwalkar et al. (2016) in the US; Tyastuti, Onishi, Ekayanti, and Kitamura (2014) in Indonesia; Vafadar et al. (2015) in Iran. The RIPLS is discussed in greater detail in the Methodology Chapter. In Section 2.4.2.2, previous studies that assess student's readiness for IPE and their knowledge on OH will be reviewed.

2.4.2.2. Previous studies on readiness for IPE and defining OH

The study presented in this thesis evaluates the readiness of students to IPE and comparatively assess their knowledge of OH. The findings of this current study will be compared to the findings of studies conducted on similar disciplinary groups. Several studies depict an overall positive attitude of students to IPE across the professions for the various domains on the survey scale (Hind et al., 2003; Horsburgh et al., 2001). Hood et al. (2014), Judge, Polifroni, and Zhu (2015), and Sollami, Caricati, and Mancini (2017) using the RIPLS all reported medical students to be the least ready for IPE. According to De Oliveira et al. (2018), this may be explained by the confidence medical students hold about their roles, perceiving themselves as the key figures involved in optimizing patient care in health

practice. This view is supported by Aziz, Teck, and Yen (2011) and Morison, Boohan, Moutray, and Jenkins (2004) who observe that MD students often assume they have more skills and knowledge to obtain than other groups. This attitude is a potential barrier to IPE development.

In the study conducted by Hoffmann and Redman-Bentley (2012), which used the Interprofessional Attitudes Questionnaire (Reeves, 2002), nursing and veterinary students' and faculty displayed more positive attitudes than other groups to IPE. Stull and Blue (2016) evaluated the attitudes of DVM students alongside other health professional students for IPE. In contrast to other studies described above, Stull and Blue (2016) report that the experience of IPE led to a decrease in affirmative attitudes to the program. According to Stull and Blue (2016), this has implications for students moving through different stages of professional identity development that may have consequences for designing IPE.

Morison et al. (2004) reported that the RIPLS showed that medical students had a strong negative rather than positive professional identity with many students agreeing with the negative statements, indicating reluctance to engage in IPE. This is consistent with other studies (for example, Horsburgh et al., 2001), which suggest that students from high status groups, such as medicine, perceive their hierarchical supremacy above other groups. According to Horsburgh et al. (2001), these students have more developed overall professional identities linked to a disinclination to engage in collaborative learning. What is unclear from the studies conducted by Horsburgh et al. (2001) and Sollami et al. (2017) is whether negative as opposed to positive professional identity differentially impact negative or positive attitudes to IPE.

According to Hertweck et al. (2012), prior public health experience lends to a readiness to engage in IPE. Aziz et al. (2011) observed that prior healthcare experience led to higher scores in this domain for nurses than MDs, proposing that as students who enter programs with already established views can contribute more strongly to professional identity formation. What is less clear is the failure of Aziz et al. (2011) to describe how this impacts readiness for IPE.

Many studies consider the implications for the timing of IPE delivery may be linked to professional identity, but the literature is unclear on whether IPE does reduce students negative stereotyping of other professional groups. Some propose early delivery (for example, Ahmad, Chan, Wong, Tan, & Liaw, 2013; Coster et al., 2008; Hood et al., 2014; Wilbur & Kelly, 2015; Williams et al., 2015). Conversely, Lindqvist et al. (2019) and others advise later delivery once professional identity formation has occurred.

This current study sought to expand on those that assessed the students' understanding of OH. Only three previous survey studies were found that assessed students understanding of OH. Wong and Kogan (2013) surveyed veterinary students reporting on their perception of the importance of OH, while Hayes et al. (2014) required students from many health professions groups, exposed to OH through IPE, to define OH. The study of Hayes et al. (2014) included veterinary and public health but neither medicine nor dual degree students. According to Hayes et al. (2014), many students neglected to mention the role of environmental health within the concept of OH. The study showed that even after the experience of IPE, veterinary students more accurately defined OH than allied health professions students, although the former less frequently included the role of the environment in the concept of OH. According to Wilkes et al. (2018), a small group OH initiative they developed augmented the positive value both faculty and students ascribed to the exercise. A number of variables have been identified across the literature that may impact student's readiness for IPE as is discussed below.

2.4.2.3. Variables influencing readiness

A number of published articles identify the independent variables that influence student readiness across the professions, many of which also influence professional identity formation (Coster et al., 2008). Variables, such as gender, professional group, prior work experience or exposure to IPE, may help explain the link between identity and readiness for IPE (Guinan et al., 2018).

Many authors (for example, Bar, Leurer, Warshawski, & Itzhaki, 2018; Guinan et al., 2018; Visser et al., 2017; Wong et al., 2016), using the RIPLS, observed that females were more positive in their attitude to team work in IPE, regardless of prior public health experience. This view is supported by Judge et al. (2015) with a clear recommendation that males need to be targeted for improving readiness to IPE. According to Hertweck et al. (2012), students with prior health care exposure scored higher on the Negative Professional identity subscale (reverse scored so higher scores pertain to more readiness) indicating greater readiness for IPE.

It is crucial that knowledge on the attitudes of students towards IPE at Caribbean-based institutions, similar to that of this current study, are ascertained. The Jefferson Scale of Attitudes towards Interprofessional Collaboration (JeffSATIC) (Hojat et al., 2015) was used to assess medical student attitudes to IPE at the Caribbean medical school, Xavier University,

in 2015 (Shankar et al., 2015). The JeffSATIC scale (Hojat et al., 2015) was used in other studies where higher scores were produced by students at American and Australian Universities with the rationale that this could be linked to the predominant Asian ethnicity of the US and Canadian students at Xavier (Shankar et al., 2015).

The literature on readiness for IPE is heavily focused on a survey approach with many authors recommending the need for more qualitative studies (Maharajan et al., 2017). In the next section, a critical review is conducted of the literature that utilizes qualitative methods for measuring the student's attitudes to IPE.

2.4.3. Qualitative methods of measurement for student attitudes to IPE and OH

Schwarz and Bohner (2001), in their exploration of the development of attitudes, describe Allport's (1935) description that defines attitude as a state of mental readiness which impacts an individual's potential responses to social experiences they encounter (for example, interprofessional learning). There is a scarcity of literature comparing student and faculty attitudes to IPE at the same institution (Hoffman & Redman-Bentley, 2012) and across disciplines.

According to Honan, Fahs, Talwalkar, and Kayingo (2015), qualitative studies have been used to explore the attitudes rather than readiness of various groups for informing IPE design as attitudes are seen as key preceptors to readiness for IPE. Stull and Blue (2016) purport that negative stereotypical assumptions about other professions effect negative attitudes to other groups, which can inhibit the readiness of students to shared learning. For this reason, open-ended questions were included in the student survey in this current study to determine the student's knowledge about OH for informing the development of IPE that includes the principles of OH at the institution where this research was conducted.

Honan et al. (2015) describe the key themes that emerged from an open-ended survey on student opinions of the factors negatively impacting IPE. These included the negative attitudes of faculty facilitating the course (though expected to be role models for interprofessional learning); the siloes that exist among the disciplinary groups; and a lack of understanding of the roles of other groups that augmented distrust for collaborative learning (Honan et al., 2015).

This study is the first known study that sought to compare the differences across these groups in defining OH. No articles could be found that compared the knowledge and attitudinal differences of dual degree students alongside MD and DVM students on the definition and relevance of OH to their practice. Only one article, Hayes et al. (2014),

compared the definition provided by DVM and MD students about OH. Uehlinger et al. (2018) in Canada as earlier described reported the results of surveys and focus groups to obtain the impact of a OH leadership program for veterinary, medical and allied health students. Students across the groups described the benefits of the program for promoting interprofessional learning and advocated for the inclusion of OH in IPE in the curricula for enabling an understanding of OH and its benefits to practice. Faculty attitudes to IPE are crucial for developing and successfully executing these initiatives and will be more critically discussed in the section below.

2.4.4. Faculty attitudes to IPE

The observations that have been made from my experiences as a practitioner educator coupled with a review of the literature, has made me aware that it is important to include a component on faculty attitudes across the disciplines of the health professions on developing IPE which includes the principles of OH. The literature on faculty attitudes to IPE is sparse. Specifically, only one article could be found that included the attitudes of DVM faculty to IPE (Hoffman & Redman-Bentley, 2012). No articles were found which evaluated the comparative attitudes of veterinary, medical and MPH faculty towards IPE and OH.

According to Watkins (2016), the design of effective IPE curricula requires the input of skilled faculty who are knowledgeable about IPE and able to facilitate IPE delivery. Health care teams that act as role models for interprofessional practice are essential for preparing students for IPE but few such models exist (Ong et al., 2017; Silver & Leslie, 2009). Loversidge and Demb (2015) discuss that faculty commitment to IPE requires administrative support for IPE.

Although faculty attitudes to IPE can be positive, limitations to executing IPE in the curriculum as described in Section 2.3.4. are reiterated throughout the literature (Lee, Celletti, Makino, Matsui, & Watanabe, 2012). Positive attitudes to IPE have been reported by health professions administrators in Canada (for example, Curran, Deacon, & Fleet, 2005) but they too report on the barriers to IPE, thus, limiting IPE delivery. Yet as Lindqvist et al. (2019) discuss, IPE can only occur if administrative leadership can support faculty in IPE development and implementation.

Suggestions, which have been made to overcome these barriers, are to utilize existing courses that can contribute to IPE and, for further evaluation of accreditation mechanisms, that limit IPE application (Curran et al., 2005). To promulgate wider execution of IPE and collaborative practice, academic institutions and health care systems must bridge the gap in

their communication and promulgate the accommodation for IPE in health policy (WHO, 2010).

2.4.4.1. Qualitative studies to assess faculty attitudes to IPE

As is relevant to this study, the feedback from faculty within the focus group sessions on IPE design and development will provide an insight into their support for IPE and perceptions about what the opportunities are for IPE development. According to Loversidge and Demb (2015), there is a gap in the lenses provided from the faculty perspectives across the health disciplines on the institutional factors that underpin and retard IPE occurrence. Qualitative methods seek to obtain the perceptions and attitude to IPE as a preceptor to readiness which is measured using quantitative designs.

Lindqvist et al. (2019) argue that there is a clear lack of translation of the theory of IPE into collaborative practice. Both Lindqvist et al. (2019) and Loversidge and Demb (2015) recommend that this necessitates greater collaboration between educators and practitioners for ensuring that students apply the theoretical principles of IPE to practice. Importantly, there is a need for policy to address the regulatory factors that inhibit IPE development and this requires the administrators of the health professions to drive such policy changes.

Bennett et al. (2011) utilized semi-structured interviews that permitted a comprehensive analysis of the faculty insights on the strengths and threats for developing IPE. On the whole, faculty members were positive on the advantages of offering IPE, but they also presented factors that could challenge its development as earlier discussed.

2.5. Mixed Methods Research (MMR) to Assess Student Readiness for IPE and Faculty Attitudes to IPE

While the purely survey-based literature revealed differences in readiness across various professional groups, there was a lack of information provided on a rationale for explaining these differences. Qualitative studies provide the much-needed depth of opinion into the likely factors that influence both student and faculty attitudes to readiness. Greene, Caracelli, and Graham (1989) advocate an MMR study as coupling the benefits of both methods as the use of more than one method provides clarification, corroboration and an expanded understanding of the research problem.

Few studies utilize an MMR approach to assess student readiness for IPE (El-Awaisi et al., 2018). Thus, it was not unexpected that only two studies could be found in the literature which pertained to the assessment of student perceptions about IPE: Acquavita, Lewis, Aparicio, and Pecukonis (2014) and Lestari et al. (2016). Acquavita et al. (2014) reported that, while the survey component indicated few differences in readiness for IPE across the professions, the interview component unpacked the individual and organizational obstacles to IPE that the students reported. Similarly, Lestari et al. (2016) discussed that the RIPLS showed that students across the programs were positive about IPE but the focus group responses uncovered that the hostile attitudes of medical students provoked negative perceptions about IPE by other student groups.

A number of theoretical frameworks will be used as a lens to collectively draw on the strengths of each framework for providing a robust explanation of the findings that enable address of the research questions. These theories will now be critically reviewed below.

2.6. Theoretical Frameworks Underpinning the Study

Osanloo, and Grant (2016) discuss that a study can consist of multiple theories that are used to explain the findings of the dissertation. These will be used to analyse the findings and draw conclusions that are expected to close the gaps in the literature which this study seeks to answer. Specifically, these relate to exploring the readiness of veterinary and dual degree MPH students for IPE and the factors influencing institutional development of IPE that incorporates OH.

The rationale for inclusion of the theories used in this study was based upon my interest to determine student readiness for IPE. The broad search of the literature revealed the availability of several scales used to measure student readiness. One criticism in the literature is that that although many studies discuss the use of the RIPLS to evaluate student readiness for IPE, specific connections to theoretical underpinnings are absent. Thus, I have sought to unpack the concept of readiness and made the connection to theories that were used to provide an explanation for examining the differences in the student's readiness for IPE in this study. The latter requires a theoretical rationale for explaining these differences in order to necessitate practitioner change (Burford, 2012).

Specifically, the use of the structuralist lens of Role theory (Merton, Bloom, & Rogoff, 1956), Social Identity Theory (SIT) (Tajfel, 1974) and the Theory of Planned

Behaviour (TPB) (Ajzen, 1991) were deemed relevant to explain the differences in readiness of medical, veterinary and dual degree students for IPE as well as their perceived definitions and ascribed relevance of OH to their future practice. The selected theories will now be discussed in greater detail. The Theory based Stakeholder Evaluation (TSE) model (Hansen & Vedung, 2010**)** was used to guide the analysis of the faculty perspectives in defining the obstacles and opportunities for developing IPE. This theoretical model is discussed in the Methodology Chapter.

The use of role theory (Merton et al., 1956) in this study is to explain the impact the student's perception of their professional identity may have, as explained by SIT, on their perceived role behaviours. The students' view of their identity coupled with their perceived role associated with their professional group is linked to their behaviour defined by their readiness to engage in IPE. The latter connections are explained through the lenses of the Theory of Planned behaviour (TPB) (Ajzen, 1991) and discussed in Section 2.5.3. Each of these theoretical frameworks will now be discussed as is relevant to this study.

2.6.1 Role theory

In this study, the RIPLS is used to measure certain items pertaining to the subscale of Roles and Responsibilities. As is relevant to this research, role theory will be used to explain the readiness of medical, veterinary and dual degree students for IPE as linked to the perception they hold of their professional roles. Role theory will also be used to evaluate the students' readiness for IPE linked to the variable of gender. Elsous, Radwan, and Mohsen (2017) propose that role theory may be used as a lens to examine the variable of gender on attitudes towards collaboration with females likely to be more positive than males. Bell, Michalec, and Arenson (2014) argue that this may be explained by the unequal status, which persists in medicine today, where men still hold more senior role positions than females. With men holding the majority of the lead professional roles in medicine and the perpetuation of these gender inequalities, this can make IPE implementation even more challenging to gain acceptance.

Michalec and Hafferty (2015) argue that existing accounts in the literature leave gaps in their discussions on the application of this theory to IPE research. Another omission from the literature on role theory is how it can be used to explain changes in student behaviours over the course of their program as the expectations about their roles become clearer.

Role theory has many early protagonists associated with 3 notable approaches and frameworks including the symbolic interactionist (Mead, 1934), structuralist (Linton, 1936) and dramaturgical (Moreno, 1934). The structuralist perspective (Merton et al., 1956) has been the most commonly applied to research in medicine and health and will be the theoretical lens used in this study. The structuralist lens deals more with the role expectations of the individual tied to the professional social group they represent. A broader perspective is provided by Elsous et al. (2017) who discuss that roles are also defined by the professional position the individual holds in the group.

As Merton et al. (1956) discusses, the medical institution provides the social context that influences the development of the perceived professional roles and values the emerging medical graduate adopts. According to Brookes, Davidson, Daly and Halcomb (2007), roles may alter as the structure of the social context alters. As Clifford (1996) discusses, the professional socialization process and the individual's perception of how the role can be fulfilled influence the role behaviours that emerge. As an example, the professional responsibilities and roles of the physician, nurse and veterinarian may change dependent upon changes in policy. The structuralist perspective will be used to discuss how IPE can lead to "role conflict" (Michalec & Hafferty, 2015, p. 183) as the perceived role of the MD and DVM students is altered. Next, the theoretical framework of Social Identity Theory will be discussed.

2.6.2 Social identity theory (SIT)

Social Identity Theory (SIT) was developed by Henri Tajfel (Tajfel, 1974) and posits that an individual's social identity or consciousness of who they are is determined by their professional group and the sense of alliance they perceive with the culture of that discipline. Burford (2012) discusses the multiplicity of identities an individual can hold which is akin to the medical or veterinary student that perceives themselves as such or defines themselves by their gender, nationality or age. According to Burford (2012), professional identity is one manifestation of the social identity. Professional group and gender are known factors that influence its development as discussed by Adams, Hean, Sturgis, and Clark (2006). Burford (2012) discusses the relevance of SIT within medical education literature to evaluate how the concept of identity can influence professional identity and student readiness for IPE. In this study, two of the domains of the RIPLS which will be explored in more detail in the next

Chapter are Negative and Positive Professional Identity as it pertains to the readiness of students for IPE.

Visser et al. (2018) discusses that Professional Identity refers to the professional values and behaviours associated with each group based on the type of socialization that occurs within its professional membership. Adams et al. (2006), Armitage-Chan and May (2018) and Michalec and Hafferty (2015) are in agreement with this adding that Professional Identity influences the professional role that the individual adopts. Best and Williams (2019) expand on this defining professional identity as consisting of both the type of work (physician, nurse, veterinarian) the individual engages in as well as the values an individual associate with their professional role. According to Burford (2012), this professional socialization process can lead to stereotyping that promulgates negative attitudes to other groups. Professional identity can be examined through the lenses of SIT (Tajfel, 1974) and Role theory.

Visser et al. (2018) states that the students' professional identity within the term readiness includes the establishment of professional value concepts and moral standings in their careers. The latter represents their disciplinary perspectives associated with their professions and, as Goldie (2012) suggests, assesses their "ways of being and relating in professional contexts" (p. e641). According to Visser et al. (2018), student readiness for IPE requires a curriculum that facilitates affective skill development coupled with producing students that perceive the value of IPE and, hence, are intrinsically motivated to engage in interprofessional learning.

Khalili, Orchard, Laschinger, and Farah (2013) discuss that "uniprofessional" (p. 448) health programs inculcate student bias and distrust of other professional groups so that engagement in IPE is perceived as a threat to their identity. According to Adams et al. (2006), professional identity is influenced by the professional program (MD students have a more developed identity than student nurses); "cognitive flexibility"(p. 58) (ability to reconfigure knowledge and adopt required roles in different situations and level of self-efficacy in their ability to do so) and previous exposure to similar health working environments. Adams et al. (2006) suggest that strong professional identities are not always predictable of expected role behaviours and, thus, students with a high professional identity will not necessarily be found to be reluctant to engage in IPE.

Burford (2012) discusses that the concept of social identity reflects an individual's perception of themselves as affiliated with a specific social group. According to Burford (2012), group members have a positive perception and attitude directed at other members of

their group but a negative attitude to the "out-group" (p. 144). Burford (2012) argues that this is associated with the stereotypic perception an individual hold about the other group. The latter explains the negative attitudes students have towards teamwork that equates with issues in communication within multidisciplinary healthcare teams which can result in clinical mistakes (Burford, 2012).

In the study conducted by Sollami et al. (2017) using the RIPLS, professional identification was associated as influencing student attitudes and readiness to IPE. Sollami et al. (2017) and Stull and Blue (2016) discuss that SIT posits that students' professional identity is impacted by the professional culture of that discipline and the sense of alliance they perceive with their group (medicine, or veterinary medicine). Sollami et al. (2017) argues that, historically, medicine has held a higher status and accompanying power over other health professional groups. According to Sollami et al. (2017), this has made it challenging for medical students to accede to situations where equal levels of power may be ascribed to other groups such as occurs in team settings and IPE. Adams et al. (2006) and Hind et al. (2003) discuss that health care students are known to hold strong identities related to their discipline from the time of enrolment in these programs and this impacts their attitudes towards other professional groups.

According to Armitage-Chan and May (2018), the temporal development of professional identity is consonant with the enunciations of Perry's framework (1968) and Nyström's model (Nyström, 2009). Perry (1968) describes the progressive cognitive development that occurs in students from the novice stages of enrolment, where they hold singular perspectives, to a senior level, where they begin to view and value alternate perspectives. Expanding on this, Armitage-Chan and May (2018) discuss that this is linked to the needs of their social context (institutional or clinical). This is in consonance with Nyström's model (Nyström, 2009) that describes the novice identity as initially immature and influenced solely by the actions of their social professional group with the progression of their cognitive development towards an integrated identity. Similarly, Coster et al. (2008) argue that the temporal positioning of IPE in the program should consider when it can be applied based on when students are more likely to be ready for IPE. However, Adams et al. (2006) argue that there is no current agreement regarding the best temporal positioning for IPE in the curriculum. Conversely, Lewitt, Cross, Sheward and Beirne (2018), in a recent article, express the view that early introduction of IPE coupled with social frameworks that draw on professional identity frameworks are essential for interprofessional learning.

In this study, the lens of SIT will consider how the MD or DVM students' Professional identity is affected by the social context of their program, medicine or veterinary medicine, and impacts their readiness for IPE. The Theory of Planned Behaviour will now be discussed.

2.6.3 The theory of planned behaviour (TPB) and SIT

Parsell and Bligh (1999) propose that positive attitudes, which support interprofessional collaboration and teamwork, are preceptors to readiness for IPE. In this study, the TPB (Ajzen, 1991) is used to evaluate student readiness for IPE at the institution by evaluating their attitudes to team work and collaboration along with the other domains of the RIPLS (McFadyen et al., 2005). TPB has been used in medical care to understand the role of health professional behaviours (Côté , Gagnon Houme, Abdeljelil & Gagnon, 2012). One limitation of this theory is that, while it has been used to measure pre and post IPE intervention changes in behaviour, it has not been used to determine how student readiness predicts effective IPE behavioural outcomes (Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013; Ruebling et al., 2014).

TPB was developed by Ajzen (1991) and sought to expand on the theory of reasoned action (Fishbein & Ajzen, 2011).The latter theory positioned human behaviour as reliant solely on the will of the individual to conduct the behaviour and the TPB incorporated the role of perceived behavioural control to that theory (Ajzen, 1991). The TPB posits that three elements inform intention, which in this study represents the intention to engage in IPE (Ajzen, 2002): (1) behavioural attitudes (2) subjective norms and (3) perceived behavioural control akin to the difficulty or ease perceived about engagement in the behaviour (Ajzen, 2002). Behavioural attitude defines the readiness or positive perception of the individual towards the behaviour or action, in this case, the student attitude to IPE. The subjective norm describes the social influence or pressure to engage in the behaviour, in this study, the action of readiness to engage in IPE. The third variable of perceived behavioural control (Ajzen, 2002), which could be defined as the intention of students to engage in IPE, was not measured. The variable of perceived behavioural control, was not used in this study because of the declaration by its founder Ajzen (2002) regarding the "conceptual ambiguities" (p. 679) in interpreting this concept.

Drawing on identity theory (Burke,1980; Stryker, 1968, 1987; Turner, 1978), the individual self consists of many identities that mirror the diverse roles an individual hold in

their social context. Identity theory posits self-identity as a socially constituted structure where the intention to partake in a particular behaviour or action (IPE engagement) is determined by what the individual perceives as the social norm, defined by their social group. Thus, both the theory of planned behaviour (Ajzen, 1991) and identity theory (Stryker & Burke, 2000) hold intention as the key factor influencing behaviour linking both theories. SIT expands on identity theory by expanding on the identity of self to the wider context of a social identity tied to the membership of a particular professional group. According to Terry, Hogg, and White (1999), the social group defines the role behaviours considered acceptable by the membership of the group.

This study explored the impact of self as well as group identity on the student's perceptions of their roles as suggested by Stryker and Burke (2000) and, thus, on their readiness to engage in IPE. Godin, Conner, and Sheeran (2005) and Godin, Belanger-Gravel, Eccles, and Grimshaw (2008) discuss that moral obligation impact intention that influences behaviour. The role of moral obligation thus may contribute to the lenses provided by other constructs provided by the TPB.

2.7. Summary

The literature on IPE and OH is growing but gaps exist as it pertains to the attitudes and readiness of veterinary and MPH faculty and students relative to medical and allied health professions students and faculty. According to Hayes et al. (2014) and Kahn et al. (2008), future studies should compare the views of MD, DVM and dual degree students as well as uncover gaps in knowledge about OH across the disciplines. Many studies discuss that discouraging attitudes to IPE as well as a perception that IPE is not relevant can impede its development (Lestari et al., 2016; Roberts, Davis, Radley-Crabb, & Broughton, 2018). According to Wong et al. (2016), attitudes are impacted by differences in curricula content and student attributes across institutional contexts. Several researchers have evaluated student perceptions about IPE in the health context (for example, Rajiah et al., 2016; Wong et al., 2016). Taken together these studies recommend that future research be expanded to various geographical contexts (Maharajan et al., 2017).

Several studies assess the perceptions of health professions faculty and administrators on IPE. However, none could be found that compiled the assessments of faculty in the medical, veterinary and public health programs on developing IPE, which includes the

principles of OH. Of the few IPE and OH initiatives that have been discussed here, no theoretical guides were provided for informing the design of IPE that incorporates OH for delivery to MD and DVM students.

The purpose of this study is fuelled by my assumptions that are based both on my experience as an educator as well as the evidence provided in this critical review of the literature. The health of animals, the environment and humans are interconnected, and medical professionals need to adopt a more comprehensive approach to practice that considers the interconnection between these factors on global health. To address issues impacting health described earlier, MD and DVM students have to be aware of issues outside of their own context that impact patient care.

Laaser, Lueddeke, and Nurse (2016) advocate that public health connects the health professions. My reflection upon the situation at this institution where this study is located is that the dual degree students that are exposed to IPE, which includes OH, may be more ready for interprofessional learning than the MD and DVM students. These outcomes, if accurate, will support my assumption that the addition of IPE and OH to the core curricula of the MD and DVM programmes would enhance the preparation of our graduates for global practice. These hypotheses will be returned to in the conclusions of this thesis.

The use of role theory, SIT and TPB used in this study draw on omissions in the literature to provide theoretical frameworks that explain the factors of role and professional identity on student's readiness for IPE. The theoretical frameworks discussed here will be returned to in the Discussion Chapter and used as a lens to analyse the findings. The next Chapter describes the rationale for the chosen methods utilized to address the research questions established for this practitioner- based research that seeks to close the gaps identified here.

Chapter 3: Methodology

This Chapter describes the methodological approach used to answer the research questions tailored to solve the practitioner-based problem earlier identified in the Introduction. I read widely on Mixed Methods Research (MMR) approaches but for the purpose of structuring this Chapter, I utilized the 13-step framework for conducting an MMR study recommended by Collins et al. (2006) and depicted in Table 4. Steps 1 and 2 are already discussed in Chapter 1. The first 10 of the 13 steps were used to frame this Chapter with steps 11, 12 and 13 described later in the Results and Discussion Chapters.

Table 4

The 13 step Framework for Conducting an MMR Study

Stages of The Study	Steps (Collins et al., 2006)
Formulation	Step 1: Determination of the study goal or aim
	Step 2: Determination of the study objectives
	Step 3 Determination of the mixing rationale for the study
	Step 4: To establish the purpose for mixing methods
	Step 5: To determine the research questions
Planning	Step 6: Selection of the sampling design
	Step 7: Selection of the MMR design
Implementation (Steps 8-11)	Step 8: Data collection
	Step 9: Data analysis
	Step 10: Data validation, /Legitimation of MMR
	Step 11: Interpretation of the MMR findings
	Step 12: Report the research findings
	Step 13. Reformulation of the research question

The research questions are reiterated below as a reminder to the reader:

1. What are the differences in readiness scores for Interprofessional Education (IPE) in the curricula between the medical, veterinary and dual degree programmes?
2. How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?
3. What is the perception of the faculty regarding the factors that influence student readiness for Interprofessional Education (IPE) as demonstrated by the results of the Readiness for Interprofessional Learning Scale (RIPLS)?
4. What do faculty perceive as the opportunities and obstacles to developing Interprofessional Education (IPE) programs for producing globally competent health professionals?

The research will inform the development of a proposed vision for the institution to execute its claim that it supports the OH philosophy directed at producing globally competent physicians and veterinarians.

My researcher perspective will be described followed by a description of the research process that was used based upon the Steps 3 to 10 of the 13-step framework according to Collins et al. (2006). A description of the fit of the theoretical frameworks within the study will follow step 10 in concluding the Chapter with a summary.

3.1 Researcher Paradigm and Positioning

Kivunja and Kuyini (2017) suggest that a paradigm relates to the researcher's philosophical perspective which informs the lens the researcher adopts to determine the methodology most appropriate to address the study questions. As a researcher I ascribe neither solely to the positivist paradigm of an objective epistemological and a realist ontological stance, neither to the constructivist paradigm of a subjectivist epistemological stance and a relational ontological one (Kivunja & Kuyini, 2017). The main weakness with either of the above paradigms is the fixed epistemological and ontological stance of both that does not allow the flexibility required to a practitioner-based issue. I, thus, ascribe to the pragmatism paradigm which subscribes to a relational stance focused on informing a practical solution to a practitioner-based problem (Kivunja & Kuyini, 2017). A broader perspective is provided by Beever and Morar (2019) in critically exploring my own perspective as a OH researcher. Beever and Morar (2019) purport the OH researcher's ontological perspective as one that views animals, humans and environment as interconnected and their epistemic positioning as one that values the interdisciplinary acquisition of knowledge.

This study seeks to determine the readiness of our health professions students and the opinions of faculty on resolving a practitioner-based issue—creating a University vision for realizing its claim to practicing a OH philosophy. In order to do this as a practitioner, I need to find a practical solution for promoting change and this requires a determination of the "workability" (Kivunja & Kuyini, 2017, p. 36) of my methodology to address the research questions. The pragmatic paradigm enables this through the use of the MMR approach using quantitative methods to determine student readiness for IPE and using qualitative methods to ascertain the perspectives of the faculty on IPE development for informing the development of IPE that includes OH.

3.2 Steps to the MMR Approach

An MMR approach was chosen for this study as it allows the researcher to combine the strengths of both qualitative and quantitative designs for investigating all aspects of the research problem that would be limited by using only one paradigmatic lens (Creswell & Plano Clark, 2017). Steps 3 to 10 of the 13-step framework recommended by Collins et al. (2006) was used to guide the research process for this study.

3.2.1. Step 3: Mixing rationale MMR design

My rationale for mixing sought to enable significance enhancement through the mixing of quantitative and qualitative methods in order to capitalize on the inferences made from the significant findings of the study. This decision is supported by Leech and Onwuegbuzie (2010) who discuss that significance enhancement is an important reason for using an MMR design. In this study, the use of faculty focus groups enabled a depth of insight to be provided on the student RIPLS scores and responses on OH for making stronger inferences towards designing IPE that includes OH.

3.2.2. Step 4: Purpose for mixing

Greene et al. (1989) advocate 5 reasons for using an MMR study to answer the research questions: “Triangulation, Complementarity, Initiation, Development and Expansion” (p. 255). In this study, the use of both quantitative and qualitative methods provided complementarity by allowing different aspects of the students’ readiness for IPE and OH to be explored through the use of the survey responses and then the faculty analysis of the findings. The second purpose for mixing was to expand the inquiry by using different methods to answer different research questions. The RIPLS tool (McFadyen et al., 2005) was used to determine student readiness for IPE and OH. The faculty focus groups, and interview were used to obtain faculty perspectives on developing IPE at the institution as well as for providing an explanation for the findings of the RIPLS scores.

3.2.3. Step 5: Research questions

The research questions were categorized as quantitative or qualitative in Table 5 to inform the development of a proposed vision for developing IPE that includes OH at the institution. According to Onwuegbuzie and Leech (2006), the research question(s) is/are key to the study aims and are subject to re-evaluation and to potential modification.

Table 5

Types of Research Questions

Question Order	Research Question	Type
1	What are the differences in readiness for IPE between medical, veterinary and dual degree students?	Quantitative
2	How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?	Qualitative
3	What do faculty perceive are the factors influencing student readiness for IPE as demonstrated by the RIPLS results?	Qualitative
4	What do faculty perceive are the opportunities and obstacles to developing IPE programs for producing globally competent health professionals?	Qualitative

3.2.4. Step 6: Sampling design

As the objective of this study was not to make generalizations of statistical significance (Leech & Onwuegbuzie, 2010), but to gain insight into the factors informing IPE development as a practitioner-based issue, a purposive sampling approach was used. In this study, a multilevel approach was chosen which consisted of sampling from two levels of the study, students for the quantitative phase and faculty and administrators for the qualitative phase (Collins, Ongwuegbuzie, & Jiao, 2007). Specifically, criterion purposeful sampling was used to identify all students and faculty that met specific inclusion and exclusion criteria for the study (Patton, 2002).

The literature that assesses the readiness of students for IPE is focused on students within medicine and the allied human health professions including occupational therapy, physiotherapy, nursing, pharmacy, optometry, nutrition, dentistry and osteopathic medicine. Very few studies have assessed the readiness of Doctor of Veterinary Medicine (DVM) students for IPE. The only programs offered at the institution that is the location of this study, are medicine, veterinary medicine and nursing. The nursing students were not included in this study as the research had already begun before this program commenced at this institution in 2018. It is for these reasons that students and faculty across the Doctor of Medicine (MD), DVM and Master of Public Health (MPH) programmes formed the target population for the study.

3.2.4.1 Quantitative phase using the RIPLS scale

Primary inclusion criteria for the participants were that MD and DVM students had to have already completed courses in infectious diseases relevant to answering the survey questions on IPE and OH and/or be enrolled as dual degree students. Additionally, Graduate MD students conducting the MPH online were also invited to participate in this study. Table 6 shows the number of students (864) invited to participate in the survey component of the study. Exclusion criteria for the study were students that had not completed the relevant courses required to participate in this study.

Table 6

Sample Population for the RIPLS survey study

Program	Population
MD (Term 5)	598
DVM (Term 5)	99
*MD MPH	145
DVM MPH	22
Total	864

* Includes Graduate MD's pursuing an MPH

3.2.4.2. Qualitative phase

3.2.4.2.1. Survey open ended questions

In this phase of the study, students that were invited to participate in the survey which included RIPLS (McFadyen et al., 2005) were also invited to respond to the open-ended questions on OH that I had added to the survey questionnaire. This data was collected concurrently with the closed-ended RIPLS (McFadyen et al., 2005) questions and analysed simultaneously.

3.2.4.2.2. Rationale for the use of focus groups

In order to determine the perspectives of the faculty and administrators on the opportunities and obstacles to developing IPE that includes OH at the institution, I decided that it was crucial to obtain the perspective of specific faculty members. These faculty were involved in teaching courses relevant to IPE and OH. I decided that bringing together these specific faculty in the various programmes as a group would stimulate discussion on their common area of expertise on IPE and OH. I chose focus groups as the best method to do so. This is supported by Rosenthal (2016) who discuss that focus groups are a specific type of method that depends on the discussion and interaction of group members for providing the answers to the research question. Importantly, the discussion provided insight into the opportunities and obstacles encountered by these faculty for developing IPE from their own unique context within the MD, DVM and MPH programmes.

A major advantage of focus groups is that when the dynamics of the group are effective, they yield a lot of information in a short time period that cannot be obtained from a

single interview. This view is supported by Cohen, Manion, and Morrison (2018) who discuss the use of focus groups as a type of group interview where the observed interactions between group members is key to providing the desired study outcomes. According to Cohen et al. (2018), focus groups are particularly useful for generating and evaluating data from different groups and obtaining their perspectives on a particular area of interest. In this study, the topic of developing IPE and OH at the institution.

Stalmeijer, McNaughton, and Van Mook (2014) recommend the use of heterogeneous focus groups to enable an assessment of the perspectives of different groups. This method was selected for this study in order to obtain the perspectives of faculty across the disciplines on the factors influencing student readiness for IPE and development of IPE. According to Onwuegbuzie, Dickinson, Leech, and Zoran (2009), the number of focus groups required is determined by the research question and the design of the study. In this study two focus groups were conducted.

The primary inclusion criteria for the faculty participants were that they were involved in teaching infectious diseases courses and public health courses relevant to IPE and OH or were senior administrators of the School of Medicine (SOM) and School of Veterinary Medicine (SVM). According to Guest, Namey, and McKenna (2017), this is crucial to ensure sufficient data collection to identify the majority of key themes pertaining to the study topic. The exclusion criteria for the study were faculty that did not have expertise in the areas of IPE and OH.

Focus group one consisted of six participants, three female and three male participants. The group included two DVM faculty members and two senior faculty in the Department of Public Health and Preventive Medicine (DPHPM) which offers the MPH program. The fifth faculty member was stationed in the MD program. The sixth and final participant is a key administrator. Many of these faculty members hold adjunct positions in the graduate school where they are involved in research as well as holding dual positions in one or other of the programs discussed in this study. Focus group two consisted of five faculty. One participant is in the MD program. Another participant is a graduate MD MPH and one of the faculty advisers for the American Medical Students Association (AMSA) responsible for assisting in the supervision of the MD students in the OH clinics. Another participant was the DVM faculty member and one of the faculty advisers for the vet students participating in the OH community clinics. Two other faculty members are in the DVM program. This group consisted of two male and three female participants.

3.2.4.2.3. Rationale for the use of the interview

The structure of the SOM is such that there are several Deans. These Deans hold faculty positions and also have administrative responsibilities. I invited all relevant senior academics of the SOM and SVM to participate in the focus groups, but none responded. Only one of the Deans of the SOM agreed to participate in an interview to be held at a different time to the focus group sessions. Hereafter, this individual will be referred to as the interviewee for ethical purposes so as to prevent identification of this administrator.

Rosenthal (2016) suggests that interviews enable the researcher to obtain insight into the individual participant opinions in contrast to those of the group perspective provided by focus groups. A semi-structured interview utilized the questions from the focus group sessions. The use of the interview method allowed me to both pose the questions and further explore the unique perceptions of the interviewee regarding the opportunities and obstacles for developing IPE that includes OH at the institution. Importantly, I felt the interview may have enabled the interviewee to have been more open in his responses than within a focus group setting with faculty that report to him. This view is supported by DiCicco-Bloom, and Crabtree (2006) who discuss this method is particularly useful for obtaining an in-depth assessment of a topic as it occurs in a less public context to that of a focus group.

Based upon the ethical approval requirements of the Institutional Research Board (IRB), the Chair of the relevant Department within the SVM contacted faculty members meeting the inclusion criteria for the study to seek their participation. In the selection of the faculty relevant to the study from the SOM, the interviewee of the SOM advised I request the Chair of the SOM Curriculum Committee identify relevant interested faculty. I also contacted additional faculty in the Graduate school that met the inclusion criteria for the study particularly due to their involvement in research pertinent to the study topic. Seven faculty were invited by the SVM Department Chair from the DVM program and five of these agreed to participate in this research. Both invited members of the MPH program faculty agreed to participate in this research. Of seven faculty invited to participate from the MD program, four agreed to participate in this research. Of three faculty in the graduate school invited to participate, two of these consented to participate in this study. Overall focus group one consisted of six participants and focus group two had five participants. According to Onwuegbuzie et al. (2009), this is consistent with the number of participants required to encourage participation and simultaneously provide sufficient diversity in the perspectives provided by the participants.

3.2.5. Step 7: MMR design selection

A sequential explanatory MMR was used as shown in Figure 3 below. In the sequential design, the quantitative phase was prioritized (QUAN ➔ qual). The quantitative approach was used to determine student readiness for IPE. Data was collected at the same time on the student responses to the open-ended questions on OH. The explanatory design was chosen for the second phase of the study as the qualitative data obtained from the focus groups and interview with faculty was used to connect to and explain the findings of the data from the quantitative phase. According to Onwuegbuzie and Leech (2004), the sequential approach enables the goals of the MMR to be achieved. Specifically, this enables the achievement of complementarity (using one method to provide clarity the findings of the other), expansion (widen inquiry by use of different methods and questions) and development (using the findings of the survey to modify the focus group/interview questions) (Onwuegbuzie & Leech, 2004).

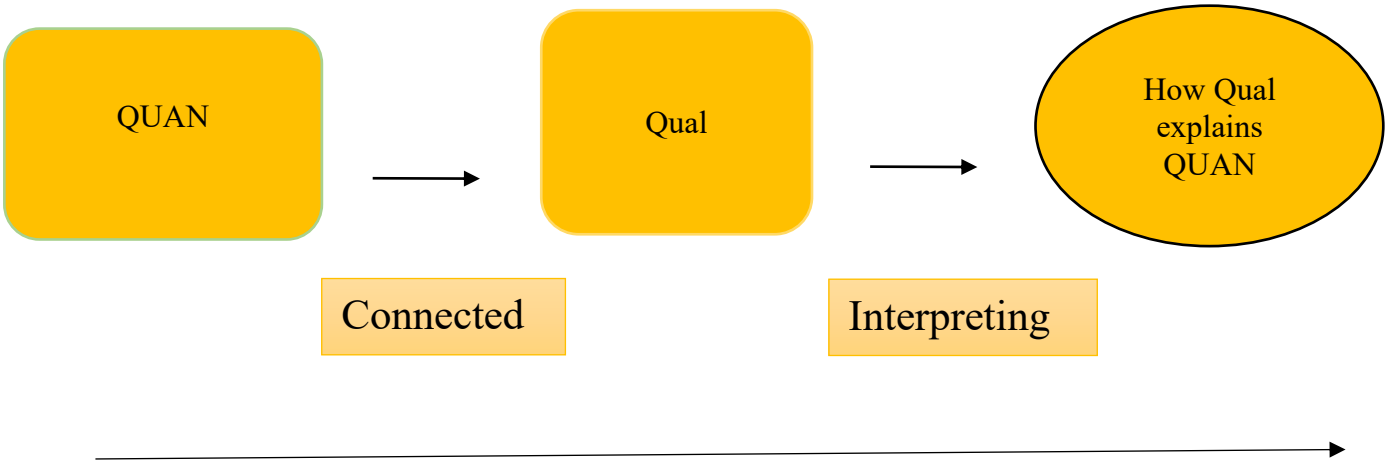

Figure 3. Sequential Explanatory MMR design depicting how the qualitative phase explains and connects with the quantitative phase **(**Creswell & Plano Clark, 2017).

3.2.5.1 Ethical considerations

The survey was submitted for ethical approval to the IRB and then to the University Survey Approval Committee. The key ethical concerns pertained to my role as a faculty member. Ferguson, Yonge and Myrick (2004) suggest this would have created a power differential if I still had a "fiduciary responsibility" (p. 56) to students participating in this study. To address this issue a number of safeguards were established: (1) I was not involved in teaching medical students or medical students undertaking an MPH; (2) I had also completed my teaching assignments and would no longer be involved in teaching the DVM students involved in this study. I was, therefore, allowed to send out a group email inviting the Term 5 MD, Term 5 DVM students and all of the MD MPH students to participate in the study. This was allowed as I had no current or expected future teaching engagements with them. However, I was not allowed to invite the DVM MPH students to participate in the study as some of these would be expected to enrol in my courses in Veterinary Public health and Epidemiology in the future. To address this ethical concern, the Chair of the DPHPM was required to email all of the DVM MPH students.

In order to avoid the issue of coercion, the IRB requires all surveys to be conducted on the University Qualtrics platform that allows students' anonymity to be preserved and the right to decline participation. The IRB does not allow surveys to be distributed within assigned lecture times as this is regarded as coercing students into participation particularly if this involves faculty requesting survey completion. In addition to IRB approval, the researcher also had to secure approval from the institutional Survey approval committee which must determine whether or not the survey is warranted. The development of the latter committee arose from a University-wide concern that students were being asked to participate in too many surveys by faculty. The overuse of students in educational research has caused ethical concerns particularly as it relates to the perception that students may feel compelled to participate for fear of being penalized. This view is supported by Leentjens and Levenson (2013) and Roberts and Allen (2015) who suggest there is a lack of evidence that students perceive that educational benefits result from their participation in educational research efforts.

I sought to seek the consent of the interviewee of the SOM to allow the involvement of students in heterogeneous focus groups across the programs. The perceived ethical concerns that arose regarding the difficulty of concealing the identity and preserving the anonymity of student respondents in qualitative methods, inhibited the approval for interviewing students (Ferguson et al., 2004).

The IRB was also concerned about how veterinary faculty would be selected without bias as many are colleagues in my department. To address the issue of selection bias, my Department Chair was required to select veterinary faculty for participation in the focus group component of the study. The Curriculum Chair of the SOM identified appropriate faculty willing to participate in the focus group component of the study. I was able to invite additional faculty outside of my department that were identified as meeting the inclusion and exclusion criteria for the study. The interviewee of the SOM could not participate in the timing of the faculty focus groups but later agreed to participate in a short interview for which ethical consent was obtained.

The anonymity and confidentiality of the participants were preserved and assured by inclusion of this within the participant information and informed consent forms for the study as recommended by Wiles, Crow, Heath, and Charles (2008). For the focus groups, faculty participants were also asked to maintain the confidentiality of their participating colleagues regarding their identities and responses. Participants were assured that neither the institution nor participants would be identifiable in any publications arising from this research. The forms also offered participants the opportunity to request removal from the study at any time.

Once approval was obtained, ethical approval was sought from The University of Liverpool (UOL)Virtual Programme Research Ethics Committee (VPREC). VPREC had additional requirements to clarify my role as a researcher in managing potential conflicts of interest. I further explained how the issue of inviting students that I would be likely to teach in the future pertaining to the dual degree DVM MPH students would be addressed as earlier described. Similar concerns to the IRB led to a requirement for deeper clarification as to how students would not be coerced into participating in this research. The process of anonymous completion of the survey was explained in addition to ensuring that all student and faculty had received the participant information forms prior to agreeing to participate and signed the appropriate consent prior to participating in any phase of the study. Access to the data including the recordings of the focus groups and interview sessions will only be available to me and are stored on a password-protected computer for 5 years to ensure that no one else has access to the data. The institutional IRB is regulated by the U.S. Department of Health and Human Services (HHS) and permits data be kept for this time period to ensure that the validity of the data can be verified if called into question (University of South Australia, Research and Innovation Services, 2014). All interview and focus group transcripts will have a unique code for each faculty member in order to prevent them from being identified. The transcripts will be kept locked in a cabinet with only the researcher having access to this data.

Once ethical approval was obtained including Survey approval by the Survey Committee, the RIPLS was developed on the Qualtrics platform. It was ensured that students would be taking the survey anonymously and would not be allowed to take the survey on more than one occasion. The consent form content was input into Qualtrics and students having read the consent would select yes or no to participating in the survey study. One week prior to activating the survey, the participant information forms were sent to the interviewee of the SOM, Chair of the SVM program responsible for Term 5 courses and the Chair of the DPHPM along with students meeting the criteria for the study.

3.2.6. Step 8: Data collection

3.2.6.1 RIPLS

Parsell and Bligh (1999) developed the original RIPLS to determine the readiness of students in the health professions for IPE. The original scale developed by Parsell and Bligh (1999) consisted of 3 domains of Teamwork and collaboration, Professional Identity and Roles and Responsibilities. The RIPLS has been modified several times in an effort to address concerns regarding its validity and reliability in different institutional contexts. McFadyen et al. (2005) and McFadyen, Webster, & Maclaren (2006) discuss the modification of the original version to establish four domains with the division of Professional Identity into Negative and Positive Professional Identity providing better content validity to the original domain. It is the version of McFadyen et al. (2005) that is used in this study.

The version of the RIPLS (McFadyen et al. 2005) used consisted of 19 items that assess student readiness for IPE within four subscales: Teamwork, Negative Professional Identity, Positive Professional Identity and Roles and Responsibilities as shown in Table 7. Each of the 19 items represents one of these four subscales. Participants were asked to respond using a 5-point Likert scale that required them to indicate how strongly they agreed or disagreed with each statement. The Likert scale ranged from strongly disagree (1), Disagree (2), Neutral (3), Agree (4) to Strongly agree (5) for items 1-9 and 13-16. The scale was reverse coded for items 10-12 and 17-19 ranging from strongly disagree (5), disagree (4), neutral (3), agree (2), strongly agree (1). Higher scores for the reverse coded items reflect greater readiness towards IPE. The RIPLS has a score range of 19-95.

Table 7

RIPLS domains and maximum score

RIPLS domains *(McFadyen et al., 2005)*	Items	Range
Total Score	1-19	19-95
Teamwork	1-9	9-45
Neg ID	10- 12	3-15
Pos ID	13-16	4-20
Roles	17-19	3-15

Two additional open-ended questions were added to the survey utilising the same data collection opportunity. These questions required respondents to define the concept and relevance of OH in response to these questions. I also included additional questions to the survey requesting demographic data on the age, gender, ethnicity, nationality, program of enrolment, prior public health experience and familiarity with OH.

3.2.6.1.2 The RIPLS domains explained

In Table 8 are the statements that represent the RIPLS 19 items (McFadyen et al., 2005, p. 596).

Table 8

RIPLS statements

Items	Statements (McFadyen et al., 2005, p. 596)
1 (Teamwork)	Learning with other students will help me become a more effective member of a health care team
2 (Teamwork)	Patients would ultimately benefit if health care students worked together to solve patient problems
3 (Teamwork)	Shared learning with other health care students will increase my ability to understand clinical problems
4 (Teamwork)	Learning with health care students before qualification would improve relationships after qualification
5 (Teamwork)	Communication skills should be learned with other health care students
6 (Teamwork)	Shared learning will help me to think positively about other professionals
7(Teamwork)	For small group learning to work, students need to trust and respect each other
8(Teamwork)	Team-working skills are essential for all health care students to learn
9 (Teamwork)	Shared learning will help me to understand my own limitations
10 (Negative Professional Identity)	I don't want to waste my time learning with other health care students
11(Negative Professional Identity)	It is not necessary for undergraduate health care students to learn together
12(Negative Professional Identity)	Clinical problem-solving skills can only be learned with students from my own department
13(Positive Professional Identity)	Shared learning with other health care students will help me to communicate better with patients and other professionals
14(Positive Professional Identity)	I would welcome the opportunity to work on small-group projects with other health care students
15(Positive Professional Identity)	Shared learning will help to clarify the nature of patient problems
16(Positive Professional Identity)	Shared learning before qualification will help me become a better team worker
17(Roles & Responsibilities)	The function of nurses and therapists is mainly to provide support for doctors
18(Roles & Responsibilities)	I'm not sure what my professional role will be
19(Roles & Responsibilities)	I have to acquire much more knowledge and skills than other health care students

The Teamwork and Collaboration factor (items 1-9) evaluates the attitudes of students to shared learning with students from other health professions along with the value they place on qualities, such as respect and trust, directed at prioritizing patient care (Visser et al. 2018). Parsell and Bligh (1999) suggest that a high score indicates that the student agrees on the benefits of interprofessional learning necessary for optimizing patient care.

The Positive Professional Identity scale (items 13-16) has positive items regarding interprofessional learning, like the benefits of developing enhanced communication, team-working and problem-solving skills (McFadyen et al., 2005). A high score indicates that the student values shared learning and perceive that shared learning will enhance these skills according to Parsell and Bligh (1999) and Visser et al. (2018). Negative Professional Identity (items 10-12) provides negatively worded items regarding working with students from other professional groups (McFadyen et al., 2005). According to Binienda (2015), this domain, Negative Professional Identity, evaluates the inclination of an individual to value collaborative professional relationships. In this study, the items for this domain are reverse scored; thus, a low score indicates that respondents are averse to interprofessional learning (Visser et al., 2018).

The domain of Roles and Responsibilities (items 17-19) measures the clarity the respondents have about their own professional role (McFadyen et al., 2005). According to Visser et al. (2018), the scores within this domain can reflect the hierarchies that exist among the various health professions particularly where scores between groups are significantly different. A low score (items are reverse scored) for both the domains of Negative Professional Identity and Roles and Responsibilities indicates a lack of readiness for IPE (McFadyen et al., 2005).

3.2.6.1.3. Administration of the RIPLS pilot

The RIPLS was piloted with faculty including my supervisor, a statistician in the DPHPM, Chair of the Information Technology Department, an SOM graduate, a DVM student, an MD MPH and DVM MPH student. No problems were reported as arising from this pilot. All piloted data were removed from the survey before conducting the final study. De Vaus (1993) and Van Teijlingen and Hundley (2002) discuss the importance of conducting a pilot for ensuring the acceptability of the survey and feasibility for obtaining good response rates.

3.2.6.1.4. Conducting the survey

Students within the MD program conduct 5 terms (two and a half years) on the island where the institution is located and then pursue the final two clinical years at a University on the US mainland. Students within the DVM program conduct 6 terms (three years) of their four-year program on island and their final clinical fourth year predominantly at institutions on the US mainland or to a lesser extent, at an institution in the UK.

The survey link was sent by the researcher to the MD and DVM Term 5 students. These students were selected as earlier mentioned in section 3.2.4.1. because by the time the students have enrolled in Term 5 of both programs, they would have completed all courses such as microbiology, pathology, parasitology, epidemiology, virology relevant to obtaining exposure to OH content. In addition, the MD students had an introductory lecture on OH administered by the MPH faculty and the DVM Term 5 students had completed their courses in Veterinary Public Health and Epidemiology which introduces them to the concept of OH.

All of the dual degree MPH students at the start and end stages of the program were included in the study. The rationale for the latter was that these students are introduced to the concept of OH early on in the MPH program. Additionally, the dual degree students typically begin their MPH when they enrol in the MD and DVM programs and complete their MPH before leaving the island to conduct their final clinical years at a mainland North American institution. The Chair of the DPHPM distributed the Qualtrics link to all dual degree MD MPH and DVM MPH students.

I used the group email listing for students within the relevant programs during the 6-week period the survey remained open (October 15-November 25) to enable the results to be presented to the faculty focus groups on November 29 and November 30, 2018. In order to secure ongoing participation, the researcher developed a power-point slide that explained the aims of the study and its relevance to the MD and DVM students. This slide was used by an MD faculty colleague, Class representatives for the MD from Term 5, DVM from Term 5 and the DVM Student Government Association (SGA) representative to encourage student participation in this study. Additionally, these individuals endeavoured to encourage the participation of the DVM and MD students via their class Facebook pages. I also contacted the interviewee of the SOM who permitted me to attend one of the MD classes along with an MD colleague during the final week in which the survey was conducted. This was done to enable me to convey the importance of the survey to the MD students with a view to encouraging further participation in this study.

The Chair of the DPHPM invited the MPH students to participate in the study and sent out two reminder emails encouraging student participation and explaining the importance of the survey and use of the results emanating from it for the improvement of the MPH program. The Public Health Student Association (PHSA) representative posted notifications about the study on the PHSA Facebook pages. The Deputy Chair of the DPHPM also emailed the DVM MPH students urging their participation in this study.

3.2.6.1.5. Limitation for the survey phase

One of the limitations in sampling the MD MPH group is that the information held by the DPHPM on enrolment numbers may not accurately represent the numbers that were undergraduate MD students as opposed to graduates conducting the online MPH. MD graduates that are unsuccessful in obtaining a residency match upon graduation, often opt to pursue an MPH in order to enhance their ability for obtaining a residency match at a US medical school. The DPHPM Chair explained that there were 2 key limitations to obtaining good responses from the graduate MDs. First, their reasons for pursuit of an MPH are solely to increase their success in obtaining a residency match as opposed to a genuine interest in public health. Secondly, this group were not campus-based as most were residing in the US while conducting the MPH online making it a challenge for the DPHPM to receive a response. These limitations did not compromise the study as they were addressed by securing further participation from the undergraduate MD and MD MPH students to boost the sample size for this study.

Another limitation of the survey was that although it was created on the Qualtrics platform so that students could not move on unless they answered the previous question, some students were able to determine which questions they wished to answer while not responding to other questions in the survey. This limitation was addressed in the following way. Only the students that answered all of the RIPLS questions were included in the analysis of readiness for IPE. These consisted of 364 of 864 invited to participate in the study. Overall, 428 of 864 respondents invited to participate in the study provided information on their overall familiarity with OH. Also, 422 of 864 invited to participate provided information on their prior public health experience. The data obtained from the first question was important to acquiring information on how students across the programs varied in their recognition of the concept of OH. The data obtained on the prior public health experience and

types of public health exposures was crucial as it may have indicated a greater familiarity by these respondents about OH.

One concern that I had was that RIPLS was designed and validated for human health professionals, not for veterinary professionals. Kinnison et al. (2011) was the only study that reported use of the RIPLS (Reid, Bruce, Allstaff & McLernon, 2006) for assessing the readiness of veterinary students and veterinary nurses for IPE. As such these authors modified the RIPLS for veterinary education. Kinnison et al. (2011) refers to the RIPLS tool used by Kinnison (2010) where statements were modified so that item 1 was "*learning with other veterinary professions (vets if you are a veterinary nurse, or nurses if you are a vet) will help me be a more effective member of a team"* (Kinnison (2010, p. 1) and item 15 *:the function of veterinary nurses is mainly to provide support for veterinary surgeons"*(Kinnison (2010, p. 2). In my study, the groups being compared consisted of respondents from 4 professional groups and this would have required modification of the tool for all groups.

I addressed this limitation by conducting the pilot with students and faculty from each of the disciplinary groups. I expressed my concern particularly with item *17 on the version of the RIPLS I used* (McFadyen et al., 2005) *"The function of nurses and therapists is mainly to provide support for doctors"* (p. 596). The responses of the veterinary students and faculty that participated was that they assumed the question to be referring to doctors as themselves as veterinarians, the nurses as veterinary nurses and therapists as allied veterinary professionals, such as veterinary technicians. For these reasons, the RIPLS version developed by McFadyen et al. (2005) was used and there were no reported issues from any of the respondent groups. This is supported by the good response rate obtained as discussed in Chapter 4.

3.2.6.2. Focus group and interview data collection

Three weeks prior to holding the focus groups, I emailed faculty to seek the best dates for them prior to the end of term. Based on their feedback I created a One Drive schedule to allow participating faculty to indicate their attendance at 1 of 2 sessions. The participant information and consent forms were emailed to them. I also contacted the Audio-visual department to set up the recordings for both sessions. These were audio-recorded and lasted approximately 2 hours each. My IPAD as a backup was used to record proceedings when the A-V system was terminated prematurely for focus group 2.

The Chair of the DPHPM thought it was necessary to have feedback from the interviewee of the SOM who was invited to participate in the focus groups but could not

attend the focus group sessions. The interviewee participated in an IPAD recorded 30-minute 1-1 interview and signed the consent form that secured participation in the interview.

The determination of the validity of the study findings is not based on the number of interviews but on whether the information obtained in a limited numbers of focus groups and interviews sufficiently answers the research questions established for the study (Baker & Edwards, 2012). Guest et al. (2017) argue that more than 80% of key themes are identified within 2-3 focus group sessions. To ensure sufficient data were collected, 2 focus groups coupled with the use of one interview were found to be sufficient. All respondents were sent the transcripts for verification upon completion of transcription and confirmed the accuracy of the reporting of their responses.

3.2.6.2.1. Preparing the Initial Data Analysis for the Focus groups and Interview

Charts that depicted the trends in student agreement/disagreement to the RIPLS questions and samples of student responses on OH across the programs were prepared and presented to the faculty in the focus groups and interview session using the medium of Microsoft PowerPoint. In Appendix D are the semi-structured focus group questions used in the faculty discussions.

3.2.6.2.2. Theory -based stakeholder evaluation (TSE) model

In this study the TSE model was used to guide the analysis of the focus group and interview findings on assessing the opportunities and barriers to developing IPE that includes the principles of OH. The Theory-based Stakeholder Evaluation (TSE) model was created by Hansen and Vedung (2010). Its use to determine the stakeholder intervention theories (opinions on the factors influencing the success or failure of an IPE intervention) has been discussed by Vestergaard, and Nørgaard (2018) and Lee et al. (2018). TSE couples the stakeholder approach with the theory-based program evaluation approach for evaluating whether a program will meet its intended outcomes or has met its intended outcomes (Weiss, 1997). The information obtained from the three elements of the stakeholder intervention theory are to inform the effective development of IPE that includes the principles of OH at the institution where this research was conducted.

Intervention (Program) theories are the assumptions of how a program or intervention may impact and positively or negatively change the current situation it is directed at

changing. Stakeholders are the best evaluators of the need for and how an intended development, such as IPE, that includes OH can inform its ability to meet its intended outcome. Stakeholders are defined as the individuals, in this case faculty, expressing the need for or that will be impacted by (increased workload; faculty development requirements) or involved in design of an intervention or program. Hansen and Vedung (2010) discuss that Stakeholder Intervention theories incorporate three elements: situation theory, causal theory and normative theory.

Similar to the use of the TSE framework described by Vestergaard, and Nørgaard (2018), focus groups and an interview were used in this study to unpack the faculty intervention theories and its three elements. Situation theory in this study entails the faculty assessment of the need for IPE that includes the principles of OH. Causal theory pertains to identifying what is required for the intervention to work effectively. In this study, causal theory explores what factors would affect the successful development of IPE that includes OH. Normative theory explains how the faculty predicted development of IPE that includes OH would improve the situation, for example, reduce gaps in the curriculum on OH. The intervention theory will incorporate the lenses of these three elements to assess the benefits and challenges to developing IPE that includes the principles of OH at the institution where this research was conducted.

3.2.6.2.3. Limitations of the focus groups and interview

In focus group one, four of six individuals attended in person while two attended remotely via skype due to their other professional commitments. The skype interview for these two persons ran into difficulties due to online breaks and clarity of sound. The visual expressions of the participants showed that they were frustrated at the poor flow of communication. To address the limitation within focus group one, I sent my focus group report as soon as it was transcribed to all of the members to verify and clarify their responses from these sessions.

I had requested an experienced colleague assist in conducting this first session to provide constructive feedback for enhancing the approach to the other focus group sessions and interview. Briefly, my colleague suggested a less detailed presentation, with greater focus on the trends revealed by the data collected. My colleague described that spending more time on asking faculty to describe how IPE and OH could be integrated and how they envisioned the transition to its development could occur would serve to enrich the findings of my study. In

focus group 2 there was excellent flow, no audio-visual disturbances occurred, and the discussion flowed freely.

3.2.7. Step 9: Data analysis

As it pertains to mixed data analysis, the following stages were involved: Quantitative and qualitative data were reduced; the data were transformed whereby qualitative data was quantitized by conversion into numerical codes (Sandelowski, Voils, & Knafl, 2009; Teddlie & Tashakkori, 2006) and data were displayed using joint displays and other visual representation such as an implementation matrix (Creswell & Plano Clark, 2017). The quantitative findings were then correlated and compared with the qualitative findings to enable integration of the data from both phases to enable inferences to be made for answering the research questions established for this research (Leech & Onwuegbuzie, 2010).

Creswell & Plano Clark (2017) recommend the use of an implementation matrix to visually display the procedures involved in developing the MMR design. The implementation matrix for this study is displayed in Table 9, which reflects the analysis of the various research questions and the links to the TSE model along with other theoretical frameworks discussed earlier.

Table 9

Implementation Matrix

Strategy	Sample	Goal/Aim	Analysis	Point of Integration
RIPLS Survey	students	Determine Readiness for IPE	ANOVA, t-tests, appropriate non-parametric tests	
RIPLS Open Questions	students	Assess OH knowledge	Thematic analysis and quantitizing prevalent themes	Analysis concurrent with that of the quantitative data for informing the focus group and interview discussions
Focus groups	faculty	Faculty evaluation of RIPLS scores and opportunities and barriers for developing IPE that incudes OH and institutional readiness for IPE.	Thematic analysis	Qualitative faculty interpretation of Quantitative student responses and use to create a vision based on identified needs
Interview	faculty	Faculty evaluation of RIPLS scores and opportunities and barriers for developing IPE that incudes OH	Thematic analysis	Qualitative faculty interpretation of Quantitative student responses and use to create a vision based on identified needs

3.2.7.1 Survey including RIPLS

Data that were collected using the Qualtrics platform was exported into the statistical software, Statistical Package for Social Sciences (SPSS) (version 21), where the survey items were analysed. Data were then analysed for normality to determine the most appropriate statistical tests to be used for the analysis. The assessment for normality was conducted using 2 methods: (1) Box plots, histograms and Q-Q plots and (2) Assessment for the homogeneity

of variance. This assessment determined the use of the relevant parametric and non-parametric tests described in the Results section.

3.2.7.2. Assessment for normality distribution of the data

3.2.7.2.1. Box plots, histograms and Q-Q plots

Histograms, Q-Q plots and box plots revealed no evidence against normality on the data sets. A large number of the data points approximate a normal distribution for most of the data except for a few outliers. According to Royston (1982), Shapiro and Wilk's test are inaccurate for analysing large numbers of samples (larger than 50 samples) for normality and, hence, were not used in this study. Skewness and kurtosis measures are based on sample averages and not reported here as these measures are very sensitive to outliers leading to the impact of outliers being significantly accentuated according to Kim and White (2003). All of the outliers were investigated to determine if they were valid measurements. They were found to be valid as they met the inclusion and exclusion criteria for the study and were, therefore, included in the study.

3.2.7.2.2. Homogeneity of variance

In order to ensure that this data did satisfy the criteria for enabling the use of parametric tests as the 1-WAY ANOVA, Levene's test was conducted to evaluate the equality of variances for samples being compared. If the assumption for homogeneity of variances was violated ($p=<0.05$ value), then non-parametric tests were used to determine statistically significant differences between groups on score (Nimon, 2012).

3.2.7.3. Qualitative data analysis

I transcribed the proceedings of the focus groups and interview verbatim immediately after the sessions were completed. Both the student responses to the open-ended survey questions and the focus group and interview transcripts were then imported into NVivo (version 12.0). NVivo software was used to organize the data from the student responses on OH and the faculty responses from the focus groups and interview transcripts. Thematic analysis was then carried out using the method recommended by Braun and Clark (2006) and further explained by Maguire and Delahunt (2017). Verification of the themes was then done manually using the method described by Ryan and Bernard (2003) of cutting and sorting of responses to identify themes. Additionally, as recommended by Onwuegbuzie et al. (2009), a

non-verbal analysis of the focus group transcripts was conducted using the recorded audio-visual sessions.

3.2.7.3.1. Survey Open-ended questions on One Health

Once thematic analysis was completed, themes and subthemes were then re-evaluated by rereading the transcripts. NVivo provided the tools to organize the data across the programs.

3.2.7.3.2. Analysis of the focus groups and interview

The steps recommended by Braun and Clark (2006) were used to conduct thematic analysis of the interview and focus group data. The process for the focus group identified themes that emerged from the responses of the group as opposed to the responses of the individual interview participant. The analysis in this study drew on those discussed by Karlsen, Gabrielsen, Falch, and Stubberud (2017) and Lee et al. (2018).

First, I transcribed each of the focus groups and interview to get familiarized with the data. Thematic analysis of the focus groups and interview data used the TSE frameworks of situation, normative and causal theory as preset categories (Lee et al., 2018) to extract codes (relevant to these categories) that were derived from the semi-structured questions posed to the participants. For example, codes obtained from the questions on factors influencing student readiness and the need for IPE and OH would have been placed with the category of situation theory; those obtained from the responses to opportunities for IPE and OH development would have pertained to the category of normative theory and the responses to challenges as well as contribution to a vision would have pertained to the category of causal theory. The latter enabled the extraction of themes relevant to answering research questions three and four. Thematic analysis used a deductive approach using the preidentified categories to code and identify themes and subthemes that emerged from the focus groups and interview data. The transcripts for each focus group and interview were then revisited to assess their compatibility with identified themes and subthemes across the data set for each focus group. In the final reporting a table of key themes and subthemes across the groups were compiled. A narrative analysis was then done around each key theme and subtheme identified culminating in an attempt to answer the key research questions for this study questions three and four.

Onwuegbuzie et al. (2009) discuss the use of non-verbal analysis that explores the use of linguistic and kinesics expressions of the respondents for conveying the respondent perspectives. In this study, non-verbal analysis was also conducted and is reported in the Result section for reporting on the supportive or dissenting perspectives of various faculty on the need for developing IPE that includes the principles of OH at the institution where this research was conducted.

3.2.7.3.3. Integration

Creswell and Plano Clark (2017) and Guetterman, Fetters, and Creswell (2015) suggest the need for using a joint display which enables a side by side comparison of data from the quantitative and qualitative phases of the MMR research for answering the research questions established for the study. A joint display is presented in the Results section of this study and used to discuss how the interpretation of the findings from both phases were integrated in the interpretation that occurs in the Discussion Chapter. The data were transformed to enable comparison and integration of the data in the analysis and interpretation in the following way: the responses to the students' prior experience to public health exposures were transformed into numeric values indicating yes or no to prior experience. Maguire and Delahunt (2017) recommend quantifying the themes by their prevalence across the programs. The latter represents quantitizing themes to later enable this transformation to enable integration in doing a side-side joint display as discussed below. The themes identified in the responses on OH were quantified in order to reflect their prevalence by students across various programs.

3.2.8. Step 10: Data validation

Cohen et al. (2018) discuss that it is not possible for the researcher to be sure that they have elucidated all possible sources of threats to the internal and external validity of their research. Cohen et al. (2018) discuss the benefits of the MMR design to triangulate the data from both the quantitative and qualitative phases, which augments the validity and reliability of the interpretation of the findings of the research. Various threats to the internal and external validity of the quantitative phase are described below.

3.2.8.1. Quantitative phase

Onwuegbuzie's (2003) provides a quantitative model to assess the validity of the quantitative component of the MMR that is used in this study. The key threats to the internal validity of the quantitative phase of this study were as follows: (1) Instrumentation and (2) Differential Selection (Selection bias). In the case of the instrumentation, it was crucial to obtain the fit of the survey instrument to the institutional context. Exploratory factor analysis was conducted to elucidate the construct validity for the RIPLS four factor model, and the findings described in the Results section (Pype & Deveugele, 2016). The reliability of the instrument was determined using Cronbach α as discussed by Tavakol and Dennick (2011) along with Spearman's ranked correlation as recommended by Nisbet, Dunn, Lincoln, and Shaw (2016). With differential selection, the inclusion criteria for the study led to specific requirements for group selection for which the wide differences in ethnicity, nationality and citizenship across the various students' groups could not be avoided. These differences could influence the differences in readiness scores obtained for the respondents across the programs.

In the Data Analysis and interpretation stage, the issues of researcher bias considered the halo effect as discussed by Onwuegbuzie (2003). The halo effect refers to allowing a priori knowledge of the opinions of various professional groups to have influenced my interpretations of the open-ended questions within the survey. This was a potential bias to my interpretation of the students' responses to OH that is declared here and that was accounted for in the analysis of the findings and conclusions made in this research.

External validity in the quantitative phase include ecological and population validity that occur across studies and pertain to the external validity of the instrument. Both of these were limitations in this study as a purposive sample was drawn limiting the generalizability of the findings of the study to the wider MD and DVM population at the institution where this study was conducted (population validity) and to institutions at other contexts (ecological validity). As the study is conducted at one point in time, temporal validity is possible (Onwuegbuzie, 2003) as student scores could have been different if the study was conducted at another time using a different student population.

3.2.8.2. Qualitative Phase

Many definitions abound on what constitutes the validity of qualitative research. Guba (1981) advocates that trustworthiness in the qualitative study is achieved by addressing the

credibility, transferability, dependability and confirmability of the study. The qualitative legitimation model developed by Onwuegbuzie and Leech (2007) is used for identifying the threats to the internal and external credibility of this study that addresses its validity.

Internal credibility

Onwuegbuzie and Leech (2007) suggest that internal credibility is the "truth value, applicability, consistency, neutrality, dependability, and/or credibility of interpretations and conclusions within the underlying setting or group" (p. 234). Threats to the qualitative phase of this study include researcher bias; descriptive validity, illusory, correlation, causal error, structural corroboration, theoretical validity and action validity.

It is possible that my own personal biases may have been subconsciously communicated by the manner in which I posed questions within the focus groups and to the interviewee that may contribute bias to the findings of the study. This bias was minimized by the use of methodological triangulation using multiple methods in this study and also data triangulation through analysis of both quantitative and qualitative data. Peer debriefing through the evaluation of my analysis process by my supervisory evaluation of my interpretations enabled the address of this bias.

The accuracy of my reporting of faculty responses for the transcripts was checked by sending the transcripts to the faculty for verification to address descriptive validity. In order to minimize theoretical validity, my supervisors also checked my use of the theoretical frameworks to aptly explain the findings of this research study. Structural corroboration was used to provide confirmation of the interpretation of my findings by using both quantitative as well as qualitative data to provide triangulation of the data. There is always the possibility of illusory correlation where I may have assumed an explanation of relationships about faculty from different departments as influencing their attitudes which were not verified. I may have made causal errors from my assumptions about relationships between individuals, for example, in reading into non-verbal expressions of participants prejudices about their views on IPE that I could not verify.

Additional efforts to ensure credibility were achieved by the methods described earlier, such as creating an audit trail through recordings of the faculty sessions. Transferability (Stalmeijer et al., 2014) was achieved by providing a detailed description of the institutional environment and the faculty perspectives that may enable comparisons to other institutions. Dependability was achieved by providing a rationale for the MMR. The

confirmability of the study was provided by declaring my own position in the research and biases held.

External Credibility of the Qualitative data

According to Onwuegbuzie and Leech (2007), external credibility refers to the capacity to generalize the findings to similar populations and contexts. This included researcher bias addressed earlier. Action validity was achieved by providing a detailed description of the findings to enable the study to be utilized by faculty stakeholders (Onwuegbuzie & Leech, 2007). How accurately the perspectives of the respondents were captured refers to the interpretive validity of the study. This was addressed by summarizing my interpretation of our discussions at the end of the focus group and interview sessions and requesting confirmation or clarification. Population, temporal and ecological generalizability as earlier described for the quantitative phase could not be done as purposive samples were used. Some element of transferability should be enabled by the fact that despite the small sample size, the perspectives are those of key faculty stakeholders involved in teaching courses related to IPE and OH initiatives.

3.2.8.3. Legitimation of the Overall Mixed Research Design

Onwuegbuzie and Johnson (2006) provide the framework for assuring the validity of the overall MMR design that is used in this study. Sample integration legitimation was addressed whereby a purposeful sample was used for both phases of the study allowing inferences from the findings of one phase with the students to be augmented through the insight of the faculty in the second phase. Peer review (supervisor) was used to address inside- outside legitimation that my interpretation of the faculty responses does balance my own view and that of my respondents. Conversion legitimation involved quantitization of data (counting themes; word count; prior public health responses made numeric) but with minimal transformation done because of risks associated with problems legitimizing these conversions. Paradigmatic legitimation involved analysing each individual phase of the study and then analysing them for integration and drawing of inferences. In legitimizing the research to different stakeholders, the audience (the research targets) will be considered in demonstrating how the MMR approach provides a more holistic and complete answer to the question the research seeks to address.

3.3. Theoretical Frameworks

The theoretical frameworks used to interpret the findings from the data collected in both phases were described in the literature review. Briefly, Role theory, Social Identity Theory (SIT) and the Theory of Planned Behaviour (TPB) will be used to interpret the findings from the survey data. The TSE model will be used to analyse the findings of the data collected from the faculty focus groups and interview.

3.4. Summary

This Chapter has described the rationale for the choice of methodological approach to answer the research questions in this study requiring address. The next Chapter will present the results of the study.

Chapter 4: Results

This Chapter focuses on describing what came out of the data. The findings of both phases of the study will be integrated and will conclude this Chapter. These results will be linked to theories introduced in the Literature review in the next Chapter. The use of the Theory-Based Stakeholder Evaluation (TSE) model to analyse the faculty responses as discussed in the Methodology Chapter will be linked to research questions three and four.

Here below is a reminder of the research questions the study sought to determine:

1. What are the differences in readiness scores for Interprofessional Education (IPE) in the curricula between the medical, veterinary and dual degree programmes?
2. How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?
3. What is the perception of the faculty regarding the factors that influence student readiness for Interprofessional Education (IPE) as demonstrated by the results of the Readiness for Interprofessional Learning Scale (RIPLS)?
4. What do faculty perceive as the opportunities and obstacles to developing Interprofessional Education (IPE) programs in meeting the recommendations of external stakeholders for producing globally competent health professionals?

4.1 RIPLS Survey

Of 864 respondents invited to participate in the study, 428 (49.5%) responded which was considered to be an adequate response rate. This view is supported by Mahler, Rochon, Karstens, Szecsenyi, and Herrmann (2014) who suggest that a 30% response rate is considered to be sufficient for surveys conducted within online platforms. The overall response rates to the survey by each program are depicted in Table 10 below.

Table 10

Sample Population and Response Rate overall

Program	Population	Respondents	Response rate (%)
MD (Term 5)	598	237	39.6
DVM (Term 5)	99	78	78.7
MD MPH	145	94	62.2
DVM MPH	22	19	86.3
Total	864	428	49.5

All 428 respondents answered the question *Are you familiar with the term One Health*. Three hundred and sixty-four (85 %) of these 428 students provided responses to all of the 19 RIPLS Likert scale questions. The response rates for these 364 respondents are displayed in Table 11 below.

Table 11

Sample Population and Response Rate for the RIPLS closed-ended questions

Program	Population	Respondents	Response rate (%)
MD (Term 5)	598	198	33.1
DVM (Term 5)	99	68	68.6
MD MPH	145	81	54.0
DVM MPH	22	17	77.2
Total	864	364	42.1

For the purpose of analyses as earlier described in the Methods Chapter, an assessment of normality was done for distribution of scores for these 364 respondents across the independent variables of age, gender, program, prior Public health experience, nationality, ethnicity and familiarity with one health using box plots, Q_Q plots and histograms. Table 12 below compares the demographics of the 428 respondents that participated in the survey.

4.1.1. Descriptive statistics.

The demographics of the 428 respondents that participated in the survey are reported in Table 12 below. The Centre for Epidemiology and Evidence (2015) recommends that to assure the privacy of individuals, cell counts <5 should not be reported hence respondents <5 in number are represented as such in Table 12 below. The demographics of all 364 respondents that completed the RIPLS 19 items are discussed below as a reference for the later analysis which sought to determine if any of these variables influenced the readiness scores significantly.

The ethnicity of the 364 respondents that answered all 19 RIPLS items, consisted of the following: The majority of Doctor of Medicine (MD) student respondents were Asian or White: 54 of 198 were Asian and 61 of 198 were White. For the Doctor of Veterinary Medicine (DVM) students the majority, 49 of 68 students were White. The majority of the MD MPH students were Asian or White: 27 of 81 were Asian and 22 of 81 were White. Most of the DVM MPH students, 14 of 17 enrolled in the program were found to be of white ethnicity. In terms of nationality of the MD student respondents that answered the 19 Likert scale items, the majority were US American citizens: 151of 198. For the DVM students the majority, 61 of 68 students were also US American. As it pertains to the dual degree Master of Public Health (MPH) students, for the MD MPH students, 54 of 81 were US American and similarly most of the DVM MPH students, 15 of 17 enrolled in the program were US American. The majority of the respondents, 263 of 364 (72%) were within the 25-34 age range.

Table 12

Demographics of All RIPLS Respondents

Variable		MD	DVM	MD MPH	DVM MPH	Total
Gender (428)	Male	99	11	50	<5	164
	Female	133	65	43	15	256
	I Prefer not to say	<5	<5	<5	<5	7
	Other	<5	<5	<5	<5	<5
Ethnicity (428)	Black/ African American	40	<5	12	<5	56
	Asian	63	<5	33	<5	101
	Hispanic or Latino	20	7	6	<5	34
	White	78	58	25	16	177
	Native American	<5	<5	<5	<5	<5
	Other	36	5	18	<5	59
Age Range (428)	18-24	59	21	15	9	104
	25-34	168	56	72	9	305
	>35	10	<5	7	<5	19
Nationality (428)	US/American	176	69	62	17	324
	Canadian	13	6	11	<5	30
	Asian	7	<5	5	<5	13
	Caribbean	23	<5	10	<5	33
	African	10	<5	3	<5	13
	Other	<5	<5	<5	<5	8
	British	<5	<5	<5	<5	<5
	European	<5	<5	<5	<5	<5
Total by Program		237	78	94	19	428

In the Tables below, the data collected from the survey will be presented and statistically significant findings will be highlighted.

4.1.2.1 Prior public health experience.

Of 422 students that answered the question related to prior public health experience before enrolling in their programs, 82 of 422 (19.0 %) reported having had prior experience to public health related exposures. Closer inspection of Table 13 below shows that the MD program had the lowest numbers of students having had prior exposure to public health, 82 of 232 (35.3%) of the MD students reporting prior experience.

Table 13

Numbers of respondents with and without prior Public Health experience

Prior Public Health Experience	Professional Program:				Total
	MD	DVM	MD/MPH	DVM/MPH	
Yes	82 (35.3 %)	54 (69.2.0%)	52 (55.3%)	19 (100%)	207
No	149 (64.2%)	24 (30.7%)	42 (2.13%)	0 (0.0%)	215
Total by Program	232	78	94	19	422

4.1.2.2 Familiarity with One Health.

Overall, 428 students responded to the survey question asking them to affirm or negate their familiarity with the term One Health. Of 428 students, 322 said they were familiar with the term and 106 said they were not. From Table 14 below it is clear that a far higher percentage of DVM and DVM MPH students expressed familiarity with OH compared to those in the MD program.

Table 14

Are you familiar with the term One Health?

Are you familiar with the term One Health?	Professional Program:				Total
	MD	DVM	MD/MPH	DVM/MPH	
Yes	155 (65%)	75 (96%)	74 (79%)	18 (95%)	322 (75.2%)
No	82	3	20	1	106 (24.8%)
Total	237	78	94	19	428

4.2. Psychometric properties of RIPLS

The construction and validation of this scale was evaluated within the institutional context this study and is detailed below. A Spearman's ranked correlation was run to assess the relationship between the 19 items of the RIPLS survey (Nisbet et al. 2016). The results are displayed in Table 15 below yielding a strong positive correlation between the items for the domains of Teamwork (items 1-9) and Positive Professional Identity (items 13-16) with an r_s (Spearman rho) range between 0.5 and 1, p = <0.05 all found to be statistically significant. Items 10-11 for the reverse scored domain of Negative Professional Identity (items 10-12) were positively correlated with items 3,4,6,9 for the domain of Teamwork and items 13,15 and 16 for the domain of Positive Professional Identity with a r_s range between 0.5 and 1, p = <0.05. As an example, Students who strongly agreed with item 3 "*shared learning with other health care students will increase my ability to understand clinical problems*," strongly disagreed with the reverse scored item 10 "*I don't want to waste my time learning with other health care students*" (McFadyen et al., 2005). Similarly, students that indicated strong disagreement with item 3 would have strongly agreed with item 10. The items within the domain of Roles (17-19) were negatively and poorly correlated (<-0.5-1) with all other corresponding items (1-16).

Table 15

Spearman's ranked correlation for Individual items on the RIPLS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1.000	.700**	.742**	.644**	.653**	.643**	.522**	.574**	.686**	0.489**	0.487**	0.395**	.598**	.486**	.561**	.586**	0.141**	0.162**	0.151**
2	.700**	1.000	.713**	.612**	.582**	.590**	.548**	.622**	.614**	0.452**	0.435**	0.339**	.559**	.465**	.541**	.575**	-0.080	0.192**	0.160**
3	.742**	.713**	1.000	.679**	.599**	.678**	.537**	.548**	.672**	0.503**	0.527**	0.418**	.607**	.487**	.599**	.621**	0.135*	0.146**	0.187**
4	.644**	.612**	.679**	1.000	.669**	.666**	.561**	.571**	.653**	0.533**	0.526**	0.453**	.573**	.487**	.585**	.589**	0.120*	0.166**	0.154**
5	.653**	.582**	.599**	.669**	1.000	.653**	.524**	.558**	.604**	0.472**	0.459**	0.376**	.589**	.516**	.568**	.569**	0.008	0.151**	-0.075
6	.643**	.590**	.678**	.666**	.653**	1.000	.570**	.565**	.673**	0.513**	0.491**	0.422**	.660**	.560**	.639**	.609**	-0.063	0.174**	0.158**
7	.522**	.548**	.537**	.561**	.524**	.570**	1.000	.637**	.539**	0.338**	0.348**	0.363**	.503**	.365**	.462**	.513**	0.195**	0.182**	0.120*
8	.574**	.622**	.548**	.571**	.558**	.565**	.637**	1.000	.611**	0.394**	0.425**	0.374**	.509**	.439**	.474**	.504**	0.130*	0.217**	-0.087
9	.686**	.614**	.672**	.653**	.604**	.673**	.539**	.611**	1.000	0.536**	0.544**	0.395**	.617**	.497**	.612**	.642**	0.116*	0.151**	0.103*
10	0.489**	0.452**	0.503**	0.533**	0.472**	0.513**	0.338**	0.394**	0.536**	1.000	.704**	.510**	0.557**	0.535**	0.556**	0.590**	.113*	.209**	.218**
11	0.487**	0.435**	0.527**	0.526**	0.459**	0.491**	0.348**	0.425**	0.544**	.704**	1.000	.553**	0.548**	0.507**	0.545**	0.590**	0.092	.186**	.192**
12	0.395**	0.339**	0.418**	0.453**	0.376**	0.422**	0.363**	0.374**	0.395**	.510**	.553**	1.000	0.492**	0.468**	0.510**	0.481**	.194**	.181**	.187**
13	.598**	.559**	.607**	.573**	.589**	.660**	.503**	.509**	.617**	0.557**	0.548**	0.492**	1.000	.680**	.777**	.794**	0.121*	0.141**	0.190**
14	.486**	.465**	.487**	.487**	.516**	.560**	.365**	.439**	.497**	0.535**	0.507**	0.468**	.680**	1.000	.699**	.725**	-0.064	-0.077	0.228**
15	.561**	.541**	.599**	.585**	.568**	.639**	.462**	.474**	.612**	0.556**	0.545**	0.510**	.777**	.699**	1.000	.773**	0.129*	0.151**	0.168**
16	.586**	.575**	.621**	.589**	.569**	.609**	.513**	.504**	.642**	0.590**	0.590**	0.481**	.794**	.725**	.773**	1.000	0.118*	0.146**	0.192**
17	0.141**	-0.080	0.135*	0.120*	0.008	-0.063	0.195**	0.130*	0.116*	.113*	0.092	.194**	0.121*	-0.064	0.129*	0.118*	1.000	.163**	.337**
18	0.162**	0.192**	0.146**	0.166**	0.151**	0.174**	0.182**	0.217**	0.151**	.209**	.186**	.181**	0.141**	-0.077	0.151**	0.146**	.163**	1.000	.176**
19	0.151**	0.160**	0.187**	0.154**	-0.075	0.158**	0.120*	-0.087	0.103*	.218**	.192**	.187**	0.190**	0.228**	0.168**	0.192**	.337**	.176**	1.000

4.2.2.1 Construct validity: Exploratory factor analysis

Exploratory factor analysis using Principal Component Analysis (PCA) with a varimax rotation was used to determine the underlying factor structure (construct validity) of the RIPLS construct used in this study context (Williams, Onsman, & Brown, 2010). The analysis was conducted using the IBM Statistical Package for the Social Sciences (SPSS v24). What is striking about the results of this analysis is that although the four-factor solution version validated by McFadyen et al. (2005) was used for this study, PCA revealed that a three-factor solution was the best construct for the data collected in this study. According to Williams et al. (2010) factor analysis is used to cluster items with higher loadings into factors or components which represent most of the responses. In other words, the items associated with the three factors or components in this factorial analysis explain most of the responses to the RIPLS that was undertaken in this study. Multiple criteria were used as the factor extraction techniques: Kaiser's criteria (Eigenvalue >1 rule), the cumulative percent of variance extracted and the Scree test.
The Kaiser-Meyer -Olkin (KMO) with a value >0.6 (0.944) and Bartlett's test with a positive chi square and a significance level of 0.00 indicated that the data obtained from the RIPLS in the Table 16 below was suitable for factor analysis in this research context (Aldrich, 2016; Welsch Rutledge, & Hoch, 2017)

Table 16

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.944
Bartlett's Test of Sphericity	Approx. Chi-Square	5183.928
	df	171
	Sig.	.000

Selection of Rotation method and Kaiser's criteria

Varimax rotation as discussed by Williams et al. (2010) was used to determine which factors would be analysed. The component matrix in Table 17 below shows the pre-rotated factor loading values for components with eigenvalues of 1. Factor loadings of 0.4 or greater were considered acceptable (Pype & Deveugele, 2016). Factor loadings for this study reveal that all of the positively scored items within two domains: Teamwork (items 1-9) and Positive Professional identity (items 13-16) items loaded onto Factor 1; the reverse scored items for the domain of Negative Professional Identity (items 10-12) loaded onto both factors 1 and 2. The reverse scored items within the domain of Roles and Responsibilities (items 17-19) loaded onto Factor 3.

The rotated factor solution using varimax rotation and shown in Table 17b reduced the cross-loadings of factors that occurred in the pre-rotated solution, aiding clarification of which items related to which specific factor. There was no need to continue further work with the three-factor model as the key difference was that one of the four domains, Teamwork, now formed one factor, the items pertaining to Negative identity (items 10-12) and Positive Identity (13-16) formed Factor 2 and the third item, roles and responsibilities was independently accounted for by Factor 3.

Williams et al. (2010) discusses that it is essential that the factors or components deduced to represent the most responses from the data set be evaluated to determine whether they represent the concept of these domains. The items loaded within each of the three factors identified for this study were analysed for representation of the original four domains and these items appeared to remain as accurately capturing these subscales.

Cumulative percent of Variance

The PCA revealed three factors with Eigenvalues > 1 shown in Appendix E accounting for 67.197% of the total variance.[1]

Scree Plot

[1] Items loading onto Factor 1 accounting for 50 % of the variance, 9.873 % for Factor 2 and 7.277 % for Factor 3.

A scree plot enabled determination of the sum of factors that explain the greatest share of correlations between the item responses (Pype & Deveugele, 2016). The Scree plot revealed a three-factor solution was preferable for analysing the data in this study as opposed to the four-factor model used (Aldrich, 2016) as shown in Appendix F.

Table 17.

Prerotation Factor Extraction

Factor Analysis of RIPLS: Factor Loadings on Component Matrix

RIPLS Items (McFadyen et al., 2005, p. 596)	Component		
	1	2	3
1.Learning with other students will help me become a more effective member of a health care team	.841	.214	-.057
2.Patients would ultimately benefit if health care students worked together to solve patient problems	.810	.315	-.131
3.Shared learning with other health care students will increase my ability to understand clinical problems	.852	.178	-.067
4.Learning with health care students before qualification would improve relationships after qualification	.840	.136	-.016
5.Communication skills should be learned with other health care students	.826	.226	.093
6.Shared learning will help me to think positively about other professionals	.849	.190	-.003
7.For small group learning to work, students need to trust and respect each other	.763	.374	-.224
8.Team-working skills are essential for all health care students to learn	.775	.350	-.163
9.Shared learning will help me to understand my own limitations	.842	.169	.011
10.I don't want to waste my time learning with other health care students	-.613	.479	-.115
11.It is not necessary for undergraduate health care students to learn together	-.589	.487	-.136
12.Clinical problem-solving skills can only be learned with students from my own department	-.446	.546	-.017
13.Shared learning with other health care students will help me to communicate better with patients and other professionals	.799	-.196	.178
14.I would welcome the opportunity to work on small-group projects with other health care students	.684	-.344	.229
15.Shared learning will help to clarify the nature of patient problems	.782	-.254	.196
16.Shared learning before qualification will help me become a better team worker	.819	-.219	.166
17.The function of nurses and therapists is mainly to provide support for doctors	-.098	.291	.691
18.I'm not sure what my professional role will be	-.189	.153	.512
19.I have to acquire much more knowledge and skills than other health care students (McFadyen et al., 2005, p.596	-.243	.400	.592

Table 17b.

Rotated Component Matrix-Varimax

	Component		
	1	2	3
1	.813	.300	
2	.855	.181	
3	.803	.330	
4	.763	.372	
5	.790	.336	
6	.800	.341	
7	.861		-.159
8	.850	.124	-.113
9	.780	.358	
10	-.213	-.744	.137
11	-.187	-.745	.117
12		-.664	.232
13	.518	.663	
14	.334	.726	
15	.469	.703	
16	.523	.688	
17			.756
18	-.129		.551
19		-.221	.720

4.2.2.2 Reliability of RIPLS.

Cronbach α was used to assess the internal consistency (the degree to which the items in the RIPLS measures the domains they claim to) of the four factor RIPLS model (McFadyen et al. 2005) used in this study. According to Tavakol and Dennick (2011) an α coefficient ≥0.70 is considered to indicate an acceptable reliability. The Cronbach α coefficients above 0.70 indicated a good level of reliability for three of the four factors used for the domains of Teamwork, Negative and Positive Professional Identity as shown in Table 18 below. Low Cronbach alpha values (less than 0.4) suggest poor internal consistency amongst the items in a domain.

It is apparent from Table 18 below that the domain of Roles and Responsibilities was found to be a poor and unreliable construct with (α = 0.481). These results are consistent with those of King et al. (2012); Li, Sun, and Zhang (2018); Mahler et al. (2015); McFadyen et al. (2005); and Yu, Jowsey, and Henning (2018). The use of few items to assess the students understanding of their roles is suggested by Tavakol and Dennick (2011) as one explanation for the reduced reliability of this domain of roles. McFadyen et al. (2005) suggests this may also be due to the students' lack of clarity regarding their professional roles as undergraduates which is in agreement with the findings of this study. In this study, most of the students are still in the preclinical stage of their program. Only the graduate MD MPH respondents and the Term 5 DVM respondents would have had have some exposure to their professional roles within clinical rotations.

Table 18

Reliability of RIPLS

Domain (McFadyen et al., 2005, p. 596)	Items	Cronbach Alpha (α)
Teamwork	1-9	0.956
Negative professional Identity	10-12	0.789
Positive Professional identity	13-16	0.917
Roles and Responsibilities	17-19	0.481
Overall	1-19	0.805

The results obtained from the Spearman's correlation and Cronbach's alpha support the findings of the 3-component construct identified by the factor analysis for the domains of teamwork, positive and negative professional identity. The Cronbach alpha value was >0.7 for each of the latter 3 domains and Spearman's correlation also revealed significant correlation across these three domains with the exception of Roles and Responsibilities. These results are supported by Tavakol and Dennick (2011) who explain that the more correlation there is between the items in a subscale, the greater the value for alpha. The results of Spearman's correlation (Nisbet et al., 2016) and Cronbach's alpha support the conclusion that roles and responsibilities was identified as a poor construct in this study population. The items are still important to analyse as individually the items had acceptable factor loadings (Pype & Deveugele, 2016) as shown in Table 17 above. However, as a result of the lack of internal consistency in the items for this domain, (Items 17-19) were analysed separately in the analysis as is consistent with the rationale for doing so provided by Aziz et al. (2011).

In the next section I shall begin using the results to answer research questions 1 and 2. These results will be elaborated upon by linking them to specific theories in the next Chapter. such as Role theory, Social Identity Theory (SIT) and the Theory of Planned Behaviour (TPB) in the next chapter.

4.3 Research Question 1:

What are the differences in IPE readiness between MD, DVM and dual degree students?

The RIPLS items were described in the Methodology Chapter. As items 17-19 pertain to the previous domain of Roles and Responsibilities are individually analysed, they are restated here:

17. The function of nurses and therapists is mainly to provide support for doctors (McFadyen et al., 2005, p. 596)

18. I'm not sure what my professional role will be (McFadyen et al., 2005, p.596)

19.I have to acquire much more knowledge and skills than other health care students (McFadyen et al., 2005, p. 596). In the section below, the impact of the program of enrolment on the students' RIPLS scores will be discussed.

4.3.1. Effect of program on scores.

Boone and Boone (2012) discuss that Likert scale items represent an interval scale measurement and descriptive statistics for interval scale items should report the mean and standard deviation for the degree of variation. Much of the literature assume that Likert items should be dealt with as ordinal scales, but most analyse them and report them using descriptive statistical methods (Brown, 2011). Respondents were required to indicate the extent to which they agreed or disagreed to each of the 19 statements in the survey. For the domains of Teamwork and Positive Professional Identity, the closer the score to five, the stronger the agreement to the statements provided indicating a readiness for interprofessional learning. For the reverse scored domains of Negative Professional Identity and Items 17-19, the closer the mean score to five, the more respondents strongly disagreed with negative statements indicating they were not averse to IPE. In Table 19 below the participant scores across programs with a maximum possible score of 95 for the 19 RIPLS items is presented.

It is apparent from Table 19 that the MD students yielded the lowest Total mean score and the DVM MPH yielded the highest Total mean score. The response to the items within the teamwork subscale conveyed that students across all programs recognized the benefits of shared learning to enhance their skills and knowledge. A One- way ANOVA was conducted on the individual RIPLS items by program for all of the respondents and yielded a statistically significant difference across programs in the Teamwork, Negative Professional Identity, Positive

Professional Identity domains (subscales) and Item 19 scores. Tukey post hoc analysis did not identify which groups were responsible for statistically significant differences in Teamwork scores.

What is striking about the figures in Table 19 is that the DVM MPH students had the highest mean score indicating the most positive attitude towards shared learning. The MD students yielded the lowest teamwork scores indicating the lowest readiness for IPE. It was observed that the scores for the DVM students for the subscales of Total score and Teamwork were closest to the scores of the MD MPH students. This indicates that the level of readiness for IPE of the DVM students is closer to that of the higher scoring dual degree students suggesting that the DVM students are comparatively more ready for IPE than the MD students.

The Negative Professional identity score also revealed statistically significant differences between groups with the Tukey post hoc analysis indicating that the MD MPH student scores were significantly higher than those of the MD students ($p=0.006$). The MD students had the lowest scores for Negative Professional Identity indicating the least support for shared learning amongst the groups that is consistent with the findings of Wong et al. (2016). Conversely, Ahmad et al. (2013) in the Asian context report that MD students have a stronger readiness for IPE than dental and pharmacy students. Ahmad et al. (2013) suggests this may be due to the prioritization that is placed on collaborative practice and team work between nurses and doctors in Singapore's healthcare setting. Taken together these results are consistent with Wong et al. (2016) who argues that differences in the RIPLS scores occur by institutional and geographic contexts.

It is apparent from the figures in Table 19 that for the domain of Positive Professional Identity, the DVM MPH and MD MPH respondents had the highest mean scores indicating the most positive attitude towards cooperative learning. Levene's test showed that the variances for comparisons made across programs for Positive Professional identity were not equal ($F_{3,360}=3.375,0.019$) and thus the non-parametric Kruskal Wallis test was conducted for comparisons across this domain. The results of the Kruskal Wallis test confirmed that there were statistically significant differences between the programs on Positive Professional Identity scores ($\chi^2(2) =13.094$, $p=0.04$). Bonferroni post hoc analysis following the Kruskal Wallis test indicated that the MD MPH's Positive Professional Identity score was statistically significantly higher than

those of the MD students indicating the MD MPH's are more positive about collaborative learning than the MD students.

The MD students had the lowest scores for Item 17 and 19 indicating that MD students are the most in agreement with negative statements and are the least ready amongst the groups for shared learning. The analysis of scores for item 19 also revealed statistically significant differences between programs where the Tukey post hoc analysis indicated that the MD MPH students scored significantly higher than the MD students (p=0.024), suggesting that the MD MPH students did not feel they had to acquire more knowledge and skills than other disciplinary groups. As mentioned earlier, this Chapter focuses on describing what came out of the data. The findings described here will be linked to role theory, SIT and the TPB in the next Chapter.

Table 19

RIPLS scores by Program

Score	MD	DVM	MD MPH	DVM MPH	
	N=198	N=68	N=81	N=17	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F (df1, df2), p-value
Total Score	67.84 (9.65)	69.25 (6.45)	69.2 (8.37)	71.12 (4.23)	$F_{3, 360}$=1.249, 0.292
Teamwork	37.56 (7.90)	39.65 (4.97)	39.57(6.74)	40.47(4.40)	$F_{3, 360}$=2.845, p=0.038
Neg ID	11.33 (2.63)	12.14 (2.48)	12.41 (2.16)	12.47 (1.56)	$F_{3, 360}$=4.875, p=0.002
Pos ID	15.42 (3.54)	16.02 (3.66)	16.62 (3.40)	17.29 (1.64)	$F_{3, 360}$=3.375, p=0.019
Roles Q17	3.42 (1.08)	3.47 (1.03)	3.70 (1.03)	3.71 (0.99)	$F_{3, 360}$=1.569, p=0.197
Roles Q18	3.73 (1.00)	4.06 (0.86)	3.84 (1.05)	3.65 (1.22)	$F_{3, 360}$=2.019,p=0.111
Roles Q19	2.66 (1.16)	2.75 (1.89)	3.09 (1.12)	2.76 (1.15)	$F_{3, 360}$=2.710,p=0.045

4.3.2 Effect of gender on scores.

The most striking aspect of the data shown in Table 20 below is that females yielded significantly higher total scores (t_{355}, -2.096, p=0.037), teamwork scores (t_{355}, -3.16, p=0.002), Positive ID scores (t_{355}, -1.929, p=0.055) than males indicating a greater readiness for IPE than

males. Males had significant lower scores than females for Negative ID (t_{355}, 2.684, p=0.008) indicating a high level of agreement to statements that advocated against cooperative learning. Males also scored higher than females for item 18 (t_{355}, 2.099, p=0.0037) indicating they had a greater confidence in what their professional roles were than females. Levene's test showed that the variances for comparisons made across gender for Q18 scores were not equal and thus the Mann Whitney test was conducted. The Mann Whitney test "failed to compute" for this item suggesting that both males and females scored almost exactly the same on this item indicating there were no statistically significant differences within gender for item 18. The findings described here will be linked to role theory in the next Chapter.

Table 20

RIPLS scores by Gender

Score	Gender		
	Male N=146 Mean (SD)	Female N=211 Mean (SD)	t(df), p-value
Total Score	67.43 (9.80)	69.39 (7.80)	t_{355} =-2.096,0.037
Teamwork	37.16 (7.93)	39.56 (6.40)	t_{355}= -3.16,0.002
Neg ID	11.37 (2.65)	12.09 (2.37)	t_{355} =-2.684,0.008
Pos ID	15.43 3.73)	16.25 (3.35)	t_{355}= -2.181,0.030
Roles Q17	2.55 (1.08)	2.44 (1.04)	t_{355}= 0.95,0.35
Roles Q18	2.33 (1.09)	2.09 (0.94)	t_{355}= 2.099,0.037
Roles Q19	3.34 (1.12)	3.13 (1.16)	t_{355}= 1.71,0.089

4.3.3 Effect of age on scores.

In the Table 21 below, no statistically significant differences were found by age groups on scores.

Table 21

RIPLS scores by Age

Score	Age			
	18-24	**25-34**	**35**	
	Mean (SD)	Mean (SD)	Mean (SD)	F (df1, df2), p-value
Total Score	67.45(10.15)	68.92 (8.31)	68.44 (5.30)	$F_{2, 361}$ =0.923,0.398
Teamwork	37.70 (8.20)	38.83 (6.84)	37.94 (4.61)	$F_{2, 361}$ =0.866,0.422
Neg ID	12.09 (2.18)	11.67 (2.63)	11.87 (1.71)	$F_{2, 361}$ =0.939,0.392
Pos ID	16.04 (3.84)	15.85 (3.45)	15.62 (2.44)	$F_{2, 361}$ =0.140,0.869
Roles Q17	2.55 (1.06)	2.46 (1.06)	2.68 (0.873)	$F_{2, 361}$ =0.532,0.588
Roles Q18	2.14 (0.91)	2.20 (1.03)	2.31 (1.01)	$F_{2, 361}$ =0.225,0.799
Roles Q19	3.09 (1.10)	3.24 (1.17)	3.75 1.00)	$F_{2, 361}$ =2.228,0.109

4.3.4. Effect of ethnicity and nationality on scores.

In Tables 22 and 23 below statistically significant differences were not found for the effects of the variables of either ethnicity or nationality on scores across the domains. Levene's test showed that the variances for comparisons made across nationalities for Total scores was not equal and hence the Kruskal Wallis was conducted. The use of both the one-way ANOVA and Kruskal Wallis confirmed these differences were not statistically significant.

Table 22

RIPLS scores by Ethnicity

Score	African American N=47	Asian N=86	Hispanic/Latino N=32	White N-146	Other N=52	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F (df1, df2, p-value
Total Score	68.09 (10.54)	68.83(9.35)	70.78 (5.97)	68.52 (7.0)	67.29 (11.08)	$F_{5,358=}$ 0.721,0.608
Teamwork	38.0 (7.89)	38.76 8.04)	40.0 (4.77)	38.8 (5.73)	36.9 (9.13)	$F_{5,358=}$ 0.982,0.429
Neg ID	12.19 (2.058)	12.19 (2.49)	11.68 (2.58)	11.63 (2.50)	11.19 (9.12)	$F_{5,358=}$ 1.52,0.1815
Pos ID	15.95 (3.43)	16.36 (3.43)	16.62 (3.44)	15.52 (3.53)	15.65 (3.62)	$F_{5,358=}$ 0.965,0.439
Roles Q17	2.80 (1.11)	2.48 (1.11)	2.72 (1.08)	2.41 (0.98)	2.34 (1.06)	$F_{5,358=}$ 1.927,0.089
Roles Q18	2.28 (0.97)	2.31 (0.98)	2.12 (1.09)	2.08 (0.96)	2.23 (1.12)	$F_{5,358=}$ 1.116,0.35
Roles Q19	3.23 (0.98)	3.13 (1.19)	3.00 (1.24)	3.31 1.17)	3.27 (1.16)	$F_{5,358=}$ 0.62,0.685

Table 23

RIPLS scores by Nationality

Score	African N=11	Asian N=8	Caribbean N=25	Canadian N=26	American N=281	Other N=13		Levene	Kruskal-Wallis
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F (df1, df2		
Total Score	63.55 (18.67)	66.38 (14.27)	67.76 (9.02)	67.65 (7.21)	68.90 (7.96)	72.13 (8.11)	$F_{7,356}$ =0.984,0.442	0.026	0.609
Teamwork	34.27 (12.79)	36.75 (11.81)	37.32 (8.77)	38.19 (5.65)	38.84 (6.60)	40.75 (6.43)	$F_{7,356}$ =0.972,0.451		
Neg ID	11.72 (1.85)	12.37 (2.07)	11.8 (2.60)	11.57 (2.52)	11.82 (2.48)	10.85 (3.89)	$F_{5,358}$ =0.501,0.776		
Pos ID	14.36 (5.39)	15.50 (4.81)	16.52 (2.29)	15.0 3.44)	15.98 (3.42)	15.92 (4.53)	$F_{5,358}$ =0.978,0.431		
Roles Q17	3.55 (1.03)	3.00 (1.12)	3.48 (1.09)	3.42 (0.90)	3.53 (1.07)	3.77 (1.01)	$F_{7,356}$ =0.57,0.723		
Roles Q18	8.63 (1.36)	8.5 (3.38)	7.72 (2.61)	8.04 (1.68)	7.89 (2.27)	7.25 (2.25)	$F_{7,356}$ =1.10,0.358		
Roles Q19	8.63 (1.36)	8.5 (3.38)	7.72 (2.61)	8.04 (1.68)	7.89 (2.27)	7.25 (2.25)	$F_{7,356}$ =0.81,0.540		

4.3.5. Effect of prior public health experience on scores.

In this study, the types of prior public health experience described across programs included students currently enrolled or having completed an MPH prior to enrolling in the DVM or MD program. Types of experience also included involvement in certain activities offered at the institution where this study occurs. These included the One Health One Medicine community clinics conducted by veterinary and medical students and faculty conjointly, MD students exposed to one lecture on One Health previously administered by the DPHPM in Term 3 and for DVM students the Veterinary Public health course taken in Term 4. Other types of prior public health experience less frequently reported included those that students had completed prior to enrolling in the MD or DVM programs at the institution where this research was conducted. These public health experiences consisted of completion of a Bachelor's degree in a public health related discipline, courses in epidemiology and biostatistics, public health externships or research.

In Table 24 below, an independent t-test was run to determine if there were differences in scores by prior public health experience. What is interesting about this data is that statistically significant differences were noted where the students that had prior experience scored higher than those without in the domain of Positive Professional Identity (t_{362}, 2.412, p=0.016). This result indicated a greater readiness for IPE than those without prior experience. The Mann Whitney test was used instead of the t test as Levene's test and showed that the variances for comparisons made by prior public health experience on the Teamwork and Total scores was unequal. The Mann Whitney test "failed to compute" for this item suggesting that there were no statistically significant differences between those with and without prior public health experience on Total and teamwork scores.

Table 24

RIPLS scores by Prior PH Experience

Score	Prior PH N=174 Mean (SD)	No prior PH N=190 Mean (SD)	t(df), p-value
Total Score	69.71 (6.67)	67.49 (10.07)	*
Teamwork	39.51(5.56)	37.63 (8.18)	*
Neg ID	11.85 (2.58)	11.71 (2.43)	t_{362} =-0.533,0.594
Pos ID	16.34 (3.15)	15.47 (3.76)	t_{362} =2.368,0.018
Roles Q17	3.57 (1.07)	3.45 (1.09)	t_{362} =1.15,0.252
Roles Q18	3.88 (1.01)	3.75 (1.00)	t_{362} =1.25,0.212
Roles Q19	2.84(1.20)	2.71 (1.12)	t_{362} =1.11,0.270

*Mann Whitney test was used instead of the t test as Levene's was violated

4.3.6. Effect of familiarity with One Health on scores.

Four hundred and twenty-eight students completed the question "are you familiar with One Health." Three hundred and sixty-four of these 428, had completed the 19 RIPLS items. In Table 25 below, there was found to be no statistically significant effect of familiarity with One Health on RIPLS scores except for items within the domain of Negative Professional Identity (t_{362} =1.906,0.057). It is apparent that for this domain, respondents that were familiar with One Health indicated greater disagreement to the negative statements indicating a greater readiness for IPE compared to those unfamiliar with the concept of OH.

Table 25

RIPLS scores by familiarity with One Health

Score	Yes N=266 Mean (SD)	No N=98 Mean (SD)	t(df), p-value
Total Score	68.77 (8.93)	67.97 (7.95)	t_{362} =0.778,0.437
Teamwork	38.77 (7.46)	37.87 (6.01)	t_{362} =1.08, 0.38
Neg ID	11.92 (2.52)	11.36 (2.42)	t_{362} =1.906,0.057
Pos ID	16.07 (3.52)	15.39 (3.42)	t_{362} =1.638,0.102
Roles Q17	3.56 (1.06)	3.36 (1.06)	t_{362} =1.657,0.098
Roles Q18	3.82 (1.02)	3.78 (0.96)	t_{362} =0.401,0.688
Roles Q19	2.77 (1.12)	2.80 (1.11)	t_{362} =0.212,0.832

4.4. Research Question 2

How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?

In this section I will describe the respondent's answers to the two survey questions requiring them to define OH and the relevance of the OH concept. Different themes and subthemes were extracted from the responses to these questions and illustrate how respondents across different programs have different ways of looking at issues in relation to IPE and One Health. The prevalence of the themes that emerge from the analysis will also be discussed below. These findings will be linked to specific theories such as Role theory, SIT and the TPB in the next Chapter.

The open-ended questions on the survey required respondents to define the concept and describe the relevance of OH to their future practice. Two hundred and sixty-five of 428 (61.9 %) students that affirmed their familiarity with the term One Health, responded to the question requiring then to define the concept shown in Table 26 below. Of 207 students that reported having prior public health experience (Table 13), 144 (69.5%) responded to this question. Ninety-six of 164 males (58.5%) and 162 of 256 females (63.2%) answered this question and the responses were similar across gender. In analysing the text obtained from the Qualtrics data in the Excel spreadsheet, none of the students responding "No" to familiarity with OH answered the RIPLS questions on One Health. N Vivo 12 software was used to organise the student response data across cases (students by programs) to enable me to begin coding the responses by shared themes across the programs.

NVivo was used to store each of the program respondent files as case files at case nodes (DVM, MD, MD MPH, DVM MPH). Codes captured key words and phrases that appeared within each individual program file relevant to the responses on the student's definition or perceptions of the relevance of OH- and these codes were housed within nodes. Once each case file was coded in this way, similar definitions and descriptions of OH relevance by responses across the programs were used to derive themes across the data set. The prevalence of these themes was counted in terms of how frequently they appeared across the programs for the definition and then the relevance of OH.

Table 26

Open-ended Question 1 on Defining One Health

	Professional Program:				Total
	MD	DVM	MD/MPH	DVM/MPH	
Define the concept of One Health	121	67	61	16	265

NVivo in addition to enabling an identification of key themes provided the ability to do a Word frequency of the top 10 words used across programs to verify the key emphasis across programs. For the MD students the terms health, medicine, humans, animals, the environment, healthcare featured as key terms used. Similar word frequencies were observed for the MD MPH students with the exception of the importance of the term "public health" within their definitions on the concept. There was a greater association between animal and human health for the DVM students but with a clear lack of emphasis on the environment. In contrast to the DVM students, the environment featured prominently within the OH concept for the DVM MPH students. The similarities and differences in the themes that emerged across the programs arising from the student definitions of OH will now be discussed.

4.4.1. Similarities and differences for themes on defining OH.

Four broad themes with subthemes emerged from the analysis of the student definitions of OH. Theme 1 was Interprofessional Collaboration with six subthemes that included the MD-DVM partnership, Antimicrobial Resistance, Zoonoses Prevention, Interprofessional Collaboration by all Medical Professionals, Interprofessional Collaboration and Global Health Through Policy Development and Interprofessional Collaboration Involving Public Health. Theme 2 was Human and Animal Health. Theme 3 was Human, Animal and Environmental Health. Theme 4 was Human Health with four subthemes that included a Holistic Approach to Health, Healthcare Access, Method or Approach for Framing Optimal Patient Care and Optimal Health program. These are illustrated in the Tables below. Table 27 discusses the similarities and differences in themes across programs. Table 28 presents the prevalence of these themes.

Table 27

Similarities and Differences in Themes across programs

Program	Similarities	Differences
MD DVM MD MPH DVM MPH	Interprofessional Collaboration-MD & vet	MD also focused on collaboration directed at optimizing human health DVM and DVM MPH focus on zoonoses prevention DVM, MD MPH focused on antimicrobial resistance DVM MPH, MD MPH, MD mention of IPC as key to policy development and global health
MD DVM MDMPH DVMMPH	Human and Animal health	
MD DVM MPH MDMPH	Human, -Animal-Environmental health	The emphasis on the role of the environment in the concept was key for the Dual degree students DVM students and the MD students placed less emphasis on this sector within the concept
MD MD MPH	Human health access	DVM and DVM MPH focus directed at human health was on zoonoses prevention
MD MPH	-	• Emphasis on multi; inter; transdisciplinary approach to health • Health Policy Development tool; legislative tool • Global health issues to address • Systems approach to health, multisectoral, transdisciplinary, global • Importance of involving public health & government in collaboration
MD to other groups	-	• Holistic approach to health care • Emphasis on human health as DVM but on equitable access for all people, mental and physical health, preventive medicine
DVM to other groups	-	• Greater emphasis on MD and Vet to prevent zoonoses • Specific about different aspects of human health benefits from MD-DVM partnership- • Little emphasis on role of environment
DVM MPH to other groups	-	• Greater emphasis on the environment along with MD and MD MPH • Emphasis on zoonoses prevention with DVM

Table 28

Prevalence of Themes by Program for Defining the Concept of One Health

Themes	MD (%)	DVM (%)	MD MPH (%)	DVM MPH (%)
Interprofessional Collaboration	**45 (37.1%)**	**54 (80.5%)**	**27 (44.2%)**	**<5 (25%)**
Human-Animal-Environmental	**34 (28.0)**	**15 (22.3)**	**21(34.4)**	**11 (68.7)**
Human & Animal Health	**13 (10.7)**	**<5**	**5 (8)**	**<5**
Human Health	**23 (19)**	**<5**	**10 (16)**	**<5**
Total	**121**	**67**	**61**	**16**

Each of the themes that emerged from the students definitions of OH across the programs will now be discussed. The first theme of Interprofessional Collaboration and its subthemes commences in the section below.

4.4.1.1. Theme 1: Interprofessional collaboration (IPC).

Interprofessional collaboration emerged as a key theme across programs in defining OH with various subthemes emerging within this theme. The importance of Interprofessional collaboration between physicians and veterinarians was a key subtheme. Other less prevalent types of collaboration reported included those between allied health professionals in the public health and government sectors. Degeling et al. (2017) amongst others discussed in Chapter 2 aptly define OH as an approach involving interdisciplinary collaboration across three sectors, animal health, environmental health and human health. In many cases the respondents indicated gaps in their definition of the concept incorrectly perceiving collaboration as specifically directed at either optimizing human health or at preserving animal and human health. Some perceived the role of animal health and environmental health as important to consider only when it was likely to impact human health. Within the overall subtheme of the MD-DVM collaboration there was specific mention of the relevance of this partnership in addressing two key global health issues: prevention of zoonoses and antimicrobial resistance. Many respondents neglected to mention the role of the environment in defining OH.

4.4.1.1.1 MD-DVM partnership.

This was an important subtheme for all four groups but a key subtheme for the DVM students. Across groups, 22 of 121 MD students, 4 of 16 DVM MPH, 11 of 61 MD MPH and 41 of 67 DVM students mentioned this collaboration. As three participants commented:

> *MD: The concept of interdisciplinary coordination, cooperation, and degrees of integration between the fields Medicine and Veterinary Medicine …*
>
> *DVM: Medical doctors and veterinarians come together to work on disease processes that affect the world.*
>
> *MD MPH: The concept of One Health is that medicine is integrative of both veterinary and human medical science and that we should be moving towards a sharing and*

collaboration between these two fields to properly relay and apply an appropriate public health system.

4.4.1.1.2. Antimicrobial resistance.

Within the subtheme of IPC and the MD-DVM partnership, one MD MPH and one DVM student mentioned antimicrobial resistance and its impact on human health as one requiring address:

MD MPH: One health is an approach to developing policies and legislation in which multiple sectors work together to achieve a better health outcome. These may include preventing spread of infectious diseases and combating antibiotic resistance.

4.4.1.1.3. Zoonoses prevention.

A recurrent subtheme of IPC was zoonoses prevention. Three program respondents discussed the importance of zoonoses prevention as a role of the MD -DVM collaboration; DVM MPH, MDs and DVM students. The majority of the DVM respondents for whom the terms "animal" and "human" appeared most frequently suggested that protecting animals and humans from zoonotic diseases was a key role of this partnership within the concept of OH. A minority of MD and MPH students mentioned zoonoses far in their definition of OH. One respondent commented:

DVM MPH: One health is the concept that veterinary medicine and human medicine are inevitably intertwined via the environment, zoonotic pathogens, etc. The term one health refers to thinking of health in a holistic manner encompassing human, animal and environmental health.

Interprofessional collaboration between the MD and DVM's was linked to the theme of human health described below that emerged across the student responses. Although DVM students considered human health as the MDs did, their focus was tied specifically to the link between human and animal health. They mentioned preventing zoonoses, antimicrobial resistance and promoting the human health bond. As one respondent commented in defining the concept

DVM: Taking care of health in both animals and people keeps both parties healthy. Recognizing the strong bond between the two and how them interacting affects the health of everyone.

In contrast many MD students for whom the words "human" and "healthcare" appeared most frequently were concerned only about optimizing human health.

4.4.1.1.4. Interprofessional Collaboration by All Medical Professionals.

Interprofessional collaboration was also a subtheme encompassing collaboration of multiple disciples for 19 MDs,4 DVMS and 4 MD MPH students. Although MD's emphasized the importance of collaboration between MDs and Vets, they described the need for Interprofessional collaboration in a broader manner to expand the concept to include professionals within all medical disciplines stating:

> *MD: One Health describes the collaboration of different fields of medicine or even STEM in general to work toward the common goal of providing improved access to healthcare whether that include biological, environmental, animal, or global health.*

4.4.1.1.5. Interprofessional Collaboration and Global health through Policy development.

Three MD MPH, 1 DVM MPH and 1 MD students clearly positioned the role of government using OH as a tool for operationalizing and legislating health policy to drive a systems approach to addressing health issues at all levels. As one commented:

> *MD MPH: bringing various health parties together eg MDs DVMs, public health officials, government officials.*

The metaphor of global health was mentioned as associated with the OH concept as a thread across many responses. The definitions of global health varied by which group was using the concept. The majority of the MD respondents associated it with to providing care for human patients while for some DVMs it was linked to the care of humans and animals. Comparing these responses, it is clear that the environment does not feature as significant in the responses of the MD or the DVM student.

4.4.1.1.6. Interprofessional Collaboration involving Public health.

For the MD MPH students, the words "public health" appeared frequently. Eight students perceived the role of public health professionals such as epidemiologists, statisticians, occupational health, environmental health, government officials involved in health policy design was key to the collaborative effort. For the dual degree students IPC was focused at policy changes in favour of preventive medicine and protecting population health in contrast to the

diagnostic emphasis on disease causation by the MD and DVM groups. As one respondent stated:

> *MD MPH: One health is the concept of having a several partnerships such as veterinarians, physicians, public health practitioners, etc working together to assess and help treat populations of certain illnesses.*

The next theme, theme 2 pertains to responses that defined OH as representing the connection between human and animal health and will now be discussed.

4.4.2. Theme 2: Human and animal health.

The connection between human and animal health emerged as a theme in defining OH for 13 MD, 5 MD MPH and for a few DVM and DVM MPH students:

> *MD: Basically, that the health of humans and animals is interconnected.*

The DVM and DVM MPH students perceived the subthemes of human and animal health as linked to the sub theme of the importance of the collaborative partnership between physicians and veterinarians to optimize the health of both species:

> *DVM MPH: To me one health means joining both the human and animal medicine together because they can both be beneficial to each other. As well as being aware of the zoonotic risks to both of them.*

Across programs there was mention of the need for collaboration between physicians and MDs specifically to address and prevent zoonotic diseases with the exception of the MD MPH students:

> *MD: The concept of merging expertise from both veterinary medicine and other specialties to target a variety of diseases like zoonoses.*

Theme 3 was the next theme to emerge from the student definitions of OH across the programs representing the responses that accurately captured the interconnection between human, animal and environmental health that defines the concept.

4.4.3. Theme 3: Human, animal and environmental health.

This was a key theme emerging across the data set for all four programs but particularly for the dual degree MD MPH and DVM MPH students. Interestingly, for the MD students the word "environment" did appear on the word frequency table in contrast to the DVM students where it

did not appear. Some students described the role of the environment in terms of its impact on human and animal health while others saw the optimization of environmental and ecosystem health as an independently important sector within the OH concept. The role of environmental health on human health was commonly mentioned as fundamental to the concept of OH for the dual degree students. As one respondent commented:

> *MD MPH: It is a concept used in global health that take into account people, animals, and the environment as contributing factors to health.*

Amongst the groups, the DVM MPH students most frequently recognized the importance of the "environment" as interconnected with human and animal health and the importance of including environmental health professionals in collaborative efforts:

> *DVM MPH: One Health is a collaborative effort between various groups within health care in an effort to find a more complete wellness of not only humans and animals but also environmental and interpersonal health.*

Theme 4 emerged from responses that perceived OH as representing only human health. This theme was key for the MD students in defining the concept.

4.4.4. Theme 4: Human health.

This was a key theme for the MD and MD MPH Students representing the responses of 23 MDs and 10 MD MPH students. The emergence of this theme indicated the knowledge gap by many MD students in defining the three sectors that form the conceptual framework of OH. These students often omitted to mention the importance of animal health and environmental health in the concept. Within this theme, there emerged 4 subthemes: A holistic approach to health, health care access, an approach for providing optimal care and an optimal health program. Some respondent comments reflect this below:

4.4.4.1 Holistic approach to health.

> *MD: One health to me, is treating the whole aspect of a person not just an illness. .....*

4.4.4.2 Healthcare access.

> *MD: Everyone deserves the same level of care regardless of gender, race, religion or any other differences.*

4.4.4.3 Method or approach for framing Optimal patient care.

MD: Having a concise method to treat patients across all health professionals in order to better serve the patient community.

For the MDs the focus of this was on OH embodying a local or global system providing optimal care for people.

4.4.4.4 Optimal Health program.

MD: one comprehensive healthcare system.

4.5 Limitations in Interpretation

Limitations of the open-ended responses including truly comprehending and capturing what some respondents meant for example in describing OH it was difficult to distinguish whether program respondents were referring to animal, human or both species in their definitions as one commented:

MD: Interdisciplinary aspect of health care where all factors must be taken into account to treat the underlying cause of a patient's disease process.

4.6. Open-ended Question 2: What is the Relevance of One Health?

In this section, respondents were asked to describe what they perceived as the relevance of One Health to clinical practice. Two hundred and seventy-three of 428 (63.7%) students that affirmed their familiarity with the term One Health in Table 14, provided responses to this question as shown in Table 29 below. Of the 273 responses obtained to this question, 177 students reported having had prior PH experience. Ninety-six of 164 males and 146 of 256 females answered this question and the responses were similar across gender.

Table 29

Respondents to open ended questions on the relevance of One Health

	Professional Program:				Total
	MD	DVM	MD/MPH	DVM/MPH	
Define the relevance of One Health	122	72	62	17	273

NVivo was again used to conduct a Word frequency to verify the key emphasis across programs for the relevance of OH to the respondents. For the MD students the key emphasis on relevance as shown in the Word frequency table was on the relationship between animal diseases and the health of their patients. The MD MPH students ascribed more relevance to environmental factors on health than the MDs. For the DVM and DVM MPH students below, the greatest emphasis was placed on the role of zoonoses prevention as it pertains to optimizing human health and the role of the vet in the latter regard pertaining to the public health. The themes that emerged from the student responses across the programs on the relevance of OH to practice will now be discussed.

Similarities and Differences in themes across programs for the Relevance of OH

In this section six key themes emerged across programs that showed how respondents differed in their definition of the relevance of One Health to practice. In the next Chapter these results will be linked to specific theories. Theme 1 was Human health with four subthemes that included a Holistic approach to health, Healthcare access, Optimal Health program and Policy tool for human health. Theme 2 was Global health. Theme 3 was Interprofessional Collaboration with one subtheme, the MD-DVM partnership. Theme 4 was Zoonoses prevention. Theme 5 was Human and Animal Health. Theme 6 was Human, Animal and Environmental Health. Table 30 presents the prevalence of these themes. Table 31 illustrates the similarities and differences in themes across programs.

Table 30

Prevalence of Themes by Program for Describing the Relevance of One Health

Themes	MD (%)	DVM (%)	MD MPH (%)	DVM MPH (%)
Interprofessional Collaboration (IPC)	11(9)	25 (12)	<5	<5
Human-Animal-Environmental	7 (5.7)	<5	16 (25.8)	6 (35.2)
Human & Animal Health	6 (4.91)	44 (61)	<5	11 (64.7)
Human Health	65 (53)	40 (55.5)	47 (76)	17 (100)
Global Health	<5	<5	<5	<5
Zoonoses Prevention (linked to Human health and IPC)	25 (20.4)	68 (94.4)	10 (16.1)	9 (52.9)
Total	122	72	62	17

Table 31

Similarities and Differences in Themes

Program	Similarities	Differences
MD MD MPH DVM MPH DVM	Human health	MD & MD MPH focus on holistic approach to human health diagnosis MD, MD MPH & DVM saw it as a Policy tool for improving health DVM MPH and DVM focus on Zoonoses prevention, antimicrobial resistance and Food safety and mental well-being
MD DVM DVM MPH MD MPH	Interprofessional Collaboration	MD collaboration with vets to prevent zoonoses in humans. DVM role of the vet in protecting public health is key in their collaborative efforts with MDs. DVM MPH and MD MPH contemplated the effect of animal, social and environmental determinants of health on patients independent of collaborative efforts with other professional groups
DVM DVM MPH	Human health: Focus on Zoonoses prevention	Protecting animal and human health. Human health focus on zoonoses prevention, food safety and antimicrobial resistance impacting human health
MD MPH and DVM MPH	-	Role of climate change and the need to contemplate the impact of environmental factors on public health (MD MPH) and human impact on precipitating climate change, biodiversity loss (MD MPH) and the effect of climate change on health (DVM MPH)
MD DVM MPH MD MPH	-	Global health and Policy formulation

Each of the themes that emerged from the students' responses about the relevance of OH across the programs will now be discussed. The first theme pertaining to responses that perceived the relevance of OH to Human health only is discussed further below.

4.6.1. Theme 1: Human health.

The theme of human health appeared as a core theme across programs, for the relevance of OH particularly for the MD and MD MPH students for whom the words "animal" linked to "human health" appeared most frequently. What was significant about these results was that this theme was also important for the DVM and DVM MPH students but as later discussed this was for different reasons of importance than it was for the MD and MD MPH respondents. There were four subthemes identified that included the relevance of OH in providing a holistic approach to health diagnosis, prevention and treatment; providing equal opportunities for healthcare access and providing a framework for creating an optimal global healthcare program. OH, was also perceived as a policy tool for initiating positive change in healthcare with an emphasis on community as opposed to individual level healthcare.

4.6.1.1 Holistic approach.

A holistic approach for consideration of the multiple causal factors impacting human health was key for the MD and MD MPH students in defining the relevance of OH to practice. The MD students saw this approach as important for identifying disease trends to minimize the social and economic impact of human disease occurrence. For the MD MPH students, this approach to identifying the multiple causal factors in the approach to diagnosis was also important but with a greater emphasis on transdisciplinary approaches to health and on community or population level medicine. Although animal and environmental health were mentioned as causal factors of disease, still the emphasis was on how they impacted human health. As one respondent commented:

> *MD: I believe one health is important in developing a holistic approach to my medical education and experience. Medicine is a multifactorial entity which can be influenced by not only our human physiological processes but the environment and social cultures around us.*

4.6.1.2 Health care access.

The relevance of One Health to the MD and MPH students was associated with equal access to healthcare for humans as one respondent stated:

> *MD MPH: I strive to help my community achieve One Health (equal access to healthcare) by helping patients address barriers to care, and I hope One Health becomes the foundation of how we provide healthcare in America.*

4.6.1.3 Optimal health program.

For some of the MDs, the relevance of the concept was associated with developing an optimal health program either locally or at the global level as one commented:

> *MD: the concept is the first step to integrating a true worldwide health program.*

4.6.1.4 Policy tool for human health.

For 2 MD's, 1 MD MPH and 1 DVM MPH student the relevance of OH was for influencing policy towards advancing health care. The DVM MPH group as with the MD MPH, this group perceived themselves as having a responsibility for protecting human and animal health but also for driving policy changes to enable address of key global health issues**:**

> *MD MPH: As a physician, it is our responsibility to advocate for our patients in need and support policy change in favour of the One health concept.*

For the DVM MPH and DVM students, the theme of human health was important but for different reasons than for the MD and MD MPH students. The DVM and DVM MPH students perceived the relevance of OH as key to improving human mental health through the companionship provided by the human-animal bond. They also viewed OH as relevant for tackling food safety issues threatening the public health as another respondent commented:
DVM: I think that humans that understand the need to take care of animals is important in making safe food available to everyone especially with the coming threats of food shortage. Healthy animals have also been linked to decreasing depression, anxiety, and other mental illnesses.

Theme 2, global health also emerged as a key theme across the programs from the students' responses about the relevance of OH to their future practice.

4.6.2. Theme 2: Global health.

This emerged as a key theme across programs for 3 MD MPH,1 DVM MPH,2 MD and 1 DVM student and often linked to relevance for optimizing human health globally. MD students perceived OH as representing their responsibility to global health and directed at improving the health of all communities as one commented:

> *MD: As a global health professional …. I will be aware and actively address concerns that translate my community practice to global health. I will work closely with my other health professional peers to ensure continuous and holistic care for my patients.*

The DVM students saw their role global health professionals but directed at a both animal and human health preservation as one stated:

> *DVM: As a global health professional we are called to not only do what benefits our species (whether animals or human) but to take into consideration the health and wellness of all species of the world.*

Theme 3 pertains to responses that perceived the relevance of OH to Interprofessional collaboration in practice and be discussed next.

4.6.3. Theme 3: Interprofessional collaboration (IPC).

Another key theme across groups was this one where respondents described the relevance of OH as providing a framework for collaboration amongst health professionals to improve the health of all species but there were differences in emphasis. For 5 MD and 3 DVM students the concept of collaboration generally was associated with the relevance of OH. For the MD it was seen as a benefit to the physician but ultimately to optimize human patient care. As one DVM commented the concept was:

> *DVM: Extremely important to the scientific principles of my veterinary training but also promotes relationship building skills with other professional groups*

4.6.3.1. Interprofessional collaboration: MD-DVM.

Eleven MD, 4 DVM MPH, 1 MD MPH and 25 DVM students placed key emphasis on the relevance of OH as associated with collaboration between these 2 groups: the MDs and the DVMs. For the veterinarians, collaboration was tied into the vets' role in educating the physician

on the effect of zoonoses on human health and for the MD working with the veterinarian to prevent the spread of zoonoses:

> *MD: there are many zoonotic diseases or diseases where animals are the reservoir or vector for human diseases. If we work together, we can keep both animal and human populations healthier.*

The MD MPH and DVM MPH students placed less emphasis on collaboration with other professionals and more on being aware of the animal and environmental health factors that could impact human and animal health respectively

> *MD MPH The more we come to learn, the more we should come to realize that there is little distinction between the principles of human health and those of environmental and animal health.*

Theme 4, Zoonoses prevention was another key theme that emerged as important to the students' perception of the relevance of OH to their future practice.

4.6.4. Theme 4 Zoonoses prevention.

The emphasis placed on human health by the DVM and DVM MPH is supported by the faculty comments within the focus group and the frequent appearance of the word "zoonoses" throughout the responses for these student groups. Faculty participants observed that OH is a vet driven concept and that the DVM students develop a sense of purpose in their role of protecting humans against zoonoses as is relevant to the concept of OH. The MDs were clearly aware of the relevance of One Health for preventing zoonoses occurrence in their patients. However, the DVM and DVM MPH students felt a great responsibility to prevent zoonoses in animals as key to their role in educating and working with the physician to protect the public health. Twenty-five of 122 MDs, 10 of 62 MD MPH, 9 of 17 DVM MPH and an overwhelming 68 of 72 DVM students ascribed the importance of this theme to OH relevance.

> *DVM: Veterinarians are an important resource for pet owners, farmers and others who are in contact with animals to receive information regarding zoonotic diseases ….*
>
> *MD: Being aware of the current epidemic zoonotic diseases for example will make me better able to treat patients that might be affected by such diseases. ….*

Zoonoses, antimicrobial resistance and Food safety were key themes for DVM and DVM MPH students and the animal health bond was a key concern as it pertains to human health. Food safety and the urgency to address antimicrobial resistance concerns pertaining to human health

was completely omitted from the responses of both the MD and MD MPH students. As DVM respondents commented:

> *DVM MPH: Faced with global challenges such as the growing world population and the rise in demand for animal protein, the environment's deterioration and decrease of natural resources and the emergence of zoonotic diseases….*
> *DVM: … Vets make sure meat is safe for humans to consume and also help to study and stop spread of diseases*

Theme 5, Human and animal health was another theme that emerged as relevant to OH but also linked to the occurrence and prevention of zoonoses and foodborne diseases of animal origin that affect the public health.

4.6.5. Theme 5: Human and animal health.

For 6 MD, 2 DVM,2 DVM MPH students, the relevance of OH was directed at optimizing the health of both species to minimize the occurrence of zoonoses and foodborne diseases threatening the public health:

> *DVM: One Health will always be a priority in a veterinary practice for the health of our patients, clients and staff.*

Finally, theme 6 represents the accurate capture of the key sectors that represent the relevance of OH to practice.

4.6.6. Theme 6: Human, animal and environmental health.

This emerged as a theme for 3 groups: 1 DVM MPH, 4 MD MPH and 7 MD students. It was clear that for the dual degree MD MPH and DVM MPH students, the role of environmental health was relevant to OH. For the dual degree respondents, the effect of climate change and air and water pollution on the public health was a key factor considered for the relevance of One Health. Conversely, none of the MD and DVM students mentioned the impact of climatic factors on health. For many of the MD and MD MPH students this originated from their concern that preserving environmental health was important only because of implications for its effect on human health. The role of the environment in the relevance of this concept was minimally reported within the DVM student responses yet the effect of climatic change and environmental

factors on the public health was key to the relevance of OH for the DVM MPH. Some of these respondents commented:

> *DVM MPH: As I hope to be a veterinarian in the public health field, One Health will be very relevant to my profession. Not only will my job be to protect and treat animals …. it will also be my duty to protect humans by …. will also involve protecting and promoting positive environmental health by working to reduce harmful emissions and combat climate change to further reduce the prevalence of harmful vectors that spread zoonotic diseases*
>
> *MD MPH: As a graduate from medical school and current candidate for Master of Public Health, the population I serve as a physician will be best treated and assisted if I have a global understanding of the welfare of the environment around the community*

Some MD MPH students were heavily cognizant of the devastating anthropogenic effects on global health through environmental events recommending the need to stymie human impact. As one commented:

> *MD MPH: Furthermore, human activities have caused significant damage to the environment and natural ecosystems, which in turn could have devastating consequences to human, animal, and plant health in the near future. Some examples of public health challenges we face … loss of biodiversity and endangered species, and climate change/global warming. …… We can no longer afford to proceed with an anthropocentric attitude and focus exclusively on human health, while ignoring the fact our health is intimately connected to the health of animals, plants, and the environment/ecosystem.*

In the next section, the Theory Based Stakeholder Evaluation (TSE) model (Hansen & Vedung, 2010) discussed in the Methodology Chapter was used to guide the analysis of the focus group and interview data towards answering Research questions three and four presented below.

Themes and Subthemes that emerged from the Faculty and Administrator Focus Groups and Interview

The themes highlighted here were common to both groups of participants as well as to the responses from the interviewee. These themes were analysed using the TSE model. This model was earlier discussed in Section 3.2.6.2.2. Jugder (2016) reports on the coding process and development of themes using NVivo. In this study the analysis of each focus group and interview transcript resulted in 8 key nodes being developed relevant to the categories of situation, normative and causal theory. These nodes included vision, student understanding of the OH concept, student readiness for IPE, the need for IPE at the institution, opportunities for introducing IPE, challenges to developing IPE that includes OH, global relevance of IPE and the role of the faculty. The identification of these nodes within the categories of situation, normative and causal theory led to the extraction of five themes: Theme 1 *Program of enrolment*, Theme 2 *Perceived relevance of IPE and OH driven by Accreditation and Exam mandates*, Theme 3 *IPE that teaches OH emphasis needed*, Theme 4 *Methods for emphasizing or incorporating OH* and Theme 5 *Developing and Implementing IPE and OH a challenge*.

4.7. Research Question 3.

What do faculty perceive are factors influencing student readiness?

The element of situation theory within the TSE model was used to analyse the participant responses below for identifying the problems the faculty felt the development of IPE that includes the principles of OH would address including those affecting the readiness of students for IPE and OH.

This research question was answered by theme 1 Program *of enrolment* and theme 2 the *Perceived relevance of IPE and OH driven by accreditation mandates.* The first two themes are used to answer research question three and discussed here. In this section the abbreviation FG1 pertains to participants from focus group 1 and FG2 participants from focus group 2. The interviewee of the School of Medicine (SOM) will be referred to interviewee throughout this section. The themes from the focus groups and interview relevant to this research question are presented in Table 32 below.

Table 32

Themes and Subthemes for Faculty perspectives on Student Readiness Scores

Themes	Subthemes
1. Program of enrolment impacts interest in OH	• DVM students and Dual degree MPH students most interested and drive the OH clinics and collaboration across disciplines • Low participation by freestanding MD • Vet students feel empowered by their role in human health protection • OH, historically a vet driven concept-mission, oath • MPH core course in OH
2. Perceived relevance of IPE and OH driven by Accreditation and Exam mandates	• United States Medical Licensing Examinations (USMLE) MD qualifying exams no requirement for OH or Vets in IPE with MD- so students interested (RIPLS scores + shared past course on Culture of Med shared Vet/Med) but not focused on OH or IPE content. -Focus Human health in RIPLS open-ended questions on OH. • MD lecture in OH removed • MPH OH a core accreditation standard • DVM not an accreditation requirement but associated with oath and mission and practice of vet med • Driven by faculty emphasis • Administrative support for IPE for Vets/MD & OH education and funding of OH clinics lacking as no mandate for IPE that includes vets with MD or OH content • Globally challenge to develop as not mandated though recommended by medical and veterinary agencies so variable development and implementation and ongoing disciplinary siloes exist

4.7.1. Theme 1: Program of enrolment.

A common view amongst the participants from the focus groups and interview showed that program of enrolment was critical to the differences in the RIPLS scores and the students perceived relevance of OH across the programs. The participants observed that overall the dual degree students yielded the highest scores indicating the greatest readiness for IPE with the MD students yielding the lowest scores consistent with a reluctance to engage in IPE. There was a sense amongst participants that the OH concept has historically been driven by the DVM program and is core to the MPH program. This aligns with the greater representation of DVM and Dual degree students in OH clinic participation. Veterinary students were described as being empowered by their human health responsibility which corroborates with the responses of the DVM students as it pertains to their human health responsibility as commented on below:

DVM FG2: but it makes the vet feel more empowered it makes the vet student speaks about zoonotic diseases …. as it could affects a human being, they feel more empowered.

The Dual degree programs have OH as a core concept and are already exposed to IPE through their shared classes with courses involving MD, MPH and DVM students in the MPH program:

DVM FG 2: I do agree it's more the MPH DVM and MD MPH than the stand-alone that see the importance of it more than the others.

The DVM participants mentioned the relevance of OH and protecting the public health as expected within the role of the veterinarian in their professional oath which states:
"Being admitted to the profession of veterinary medicine, I solemnly swear to use my scientific knowledge and skills for … ……, the promotion of public health, …" (AVMA, 2019).

DVM FG1: So, a lot of vet students think the med oath and vet oath are the same thing and they are very very different vets do not first say do no harm to they say first protect public health and human health and the environment and then animals …. I agree it's really the Med side the focus of where it can be integrated. The vets already have it.

While the Public health program is not explicit about OH in their mission, the dual degree participants discussed that One Health is a key concept for the program as OH is an accreditation requirement for the MPH program. The mission of the School of Veterinary Medicine (SVM) incorporates the importance of OH as one participant commented:

DVM FG1: in the SVM mission statement OH is already there.

The mission of the SVM is available on the University website and states as follows: "*The mission of …… School of Veterinary Medicine …. We are guided by a One Health/One Medicine philosophy, ……*

This is not the case for the School of Medicine (SOM)and was suggested as a possible reason for the differences in emphasis placed on its relevance across the programs. MD participants discussed that the absence of the need for IPE and OH education in this program is consistent with the lack of emphasis placed on it in the United States Medical Licensing Examinations (USMLE) qualifying examinations. In the latter case the medical accreditation agency does not require OH content or IPE involving vets as part of their requirement for qualifying as a physician.

> *MPH FG1: The students are expressing a willingness and even in this early stage of their career they are seeing a benefit to IPE and they could see the value of the OH concept even though it's not mandated and they have other things on their priority of concerns.*

The Interviewee also stated that the readiness for IPE reflects what students would prefer to have, but it is a want rather than a need or demand quoting:

> *interviewee SOM: Its either a preference or…it is a preference I prefer to have that or if you are looking at satisfaction, I would be satisfied if …., if you want to developing the change right, called the 6-step approach by Kern.*

Theme 2 was another key theme that emerged from the faculty and administrator discussions on how the requirement or lack of a requirement for IPE and OH within the accreditation criteria of the programs influences the relevance of IPE and OH to the different student groups.

4.7.2. Theme 2: Perceived relevance of IPE and OH driven by accreditation mandates.

A common view amongst the participants from the focus groups and interview showed that the student interest in IPE and OH was driven by accreditation mandates. The overall RIPLS scores across programs showed that students are interested in IPE. Student definitions on OH also indicated that most perceived some relevance of the concept to one or more of the health sectors. However, it is clear that although the MD student indicated interest in IPE and OH, they do not perceive IPE and OH as essential for their program as it is not a requirement for their qualifying examinations for medicine. The MPH participants reported that these findings are supported by their attitudes to faculty that teach OH courses in the MD program as well as their lack of interest in the OH clinics.

MPH FG1: We have this challenge when we do BPM3 in Term 3 which has a lot of public health the question always comes up why are you asking me this, where is this on my exam. So, if OH is not a required question on the exam, you won't be surprised how quickly annoyed they get. You get written up in the evaluations, ……, get rid of it.

This contrasts greatly with the understanding of the MD MPH students in their wider definition of the OH concept and its relevance to their future practice and role as health policy makers. The lack of administrative support and lack of funding for the OH clinics aligned with the lack of participation of freestanding MD students in these clinics, is driven by the lack of accreditation drivers for IPE that includes the principles of OH in the MD program. MD faculty described that the absence of the need for IPE and OH education in this program is consistent with the lack of emphasis placed on the USMLE qualifying examinations. The medical accreditation agency does not require OH content or IPE involving vets as part of their requirement as the MPH participants commented:

MPH FG1: The students are expressing a willingness and even in this early stage of their career they are seeing a benefit to IPE and they could see the value of the OH concept even though its not mandated …. but that will not happen both from the student and the University perspective until it has value, or someone says its important enough and you won't be accredited or you will not pass your exams or be licensed as a doctor for example I teach the OSHA bloodborne pathogen course it's not a requirement of the USMLE boards but it is a requirement for them to be able to go into the clinic and the

> *hospitals and to be a doctor so it does not necessarily have to be an exam question but you have to do these 4 things in order to become a MD. I think DVM, OH is already built in so you have to prove in some way that you have been involved in interprofessional experiences so the school then feels how they will do that and will do that, so it has to be incentivized that desire to implement IPE and OH in a meaningful way*

The element of normative theory within the TSE framework (Hansen & Vedung, 2010) was used as a lens to understand how the development of IPE that includes OH could address the need for IPE identified by the lens of situation theory above. The framework of normative theory was used to analyse the faculty and administrator perspectives towards answering research question 4 below.

4.8 Research Question 4.

What are the opportunities and obstacles to developing IPE to meet therecommendations of key stakeholders?

Normative theory captures how the faculty perceive the IPE/OH intervention would address the needs of the institution for IPE that includes OH. Benefits that were discussed included opportunities for closing gaps in the MD and DVM curriculum identified in this study, opportunities for interdisciplinary collaboration and for positioning the University as a OH centre of excellence. Also discussed were the opportunities for developing communities of practice by enabling students to work on zoonotic case-based scenarios with clinicians which would enable easier translation of theory to practice for future graduates.

The lens of causal theory, the third element of the TSE enabled evaluation of the stakeholder's responses to determine what they felt was necessary in order for the intervention to succeed at the institution where this research was conducted. Factors requiring address included concerns regarding high faculty workload, curriculum mapping and other challenges to development that were revealed in this study. Identifying the source of the challenges to IPE development would be used to find methods by which the these sources could be mitigated to facilitate IPE and OH development and implementation.

Three of the 5 key themes that emerged from the focus group and interview were used to answer this question. Theme 3 *IPE that teaches OH emphasis needed*, Theme 4 *Methods for*

emphasizing or incorporating OH and Theme 5 *Developing and Implementing IPE and OH a challenge*. These themes were common to both groups of participants as well as to the responses from the interviewee. These Themes and their subthemes are shown in Table 33 below.

Table 33

Themes for Opportunities and Barriers to Developing IPE/OH

Themes	Subthemes

3.IPE that teaches One Health emphasis needed	• Global relevance including:
	  ○ AAMC requirement
	  ○ Internet awareness about food safety and health related to this
	  ○ WHO, PAHO requirement for collaboration in attending to disasters
	  ○ Climate change
	  ○ Zoonoses emergence
	  ○ Advancing knowledge of each profession
	• MD gaps in consideration of antimicrobial resistance, food safety as their responsibility also to human health; vets human-animal focus not environment or social factors impacting health

4.Methods for emphasizing or incorporating OH	• Selectives/electives • 1 lecture • OH track in MPH and advertising externally and internally for those interested • Emphasizing the human-animal-environmental connection where it is already taught • Infectious disease residencies for MDs • Opportunities at SGU shared campus location and already have IPE through OH clinics and Dual MPH • Involving faculty across Arts& Sciences (conservation) +MD, Vet…
5.Developing and Implementing IPE and OH a challenge	• Requires defining IPE- a challenge- even though increasing importance in US medical school by AAMC • Requires Curriculum mapping and Identification as a need • Assessing it a challenge and ensuring translates to practice • US not globally directed graduate workforce • Exam and content focus of curriculum • Must be faculty driven and faculty overloaded • Which disciplinary group is responsible in cases of zoonoses? • Shared courses insufficient must interact-projects, discussions, practical assignments in clinical environments • Unstructured where it occurs in curricula • Large class size • IPE required in MD but not including nonhuman health medical disciplines (Vet) • Scheduling it in a packed curriculum

4.8.1. Theme 3: IPE that teaches OH emphasis needed.

Faculty described that IPE and OH does exist in some pockets of the University in the form of the Dual degree programs and the One Health One Medicine clinics, but it was needed for the core programs particularly medicine as earlier described. As commented upon:

> *DVM FG2: Because when you think about it for graduate students and for the graduate students, I mean the Dual degree students where they are in a class with MD and DVM students so SGU is actually doing IPE so from that perspective SGU can actually argue they are miles ahead..*

The respondents in FG1 in commenting on the responses to the RIPLS question on OH described that OH is already core to the MPH program and to the DVM curriculum and mission stating:

> *MPH FG1: So, as an overall DVM's have a better appreciation or understanding of OH compared to MD and this is also reflected in the dual degree programs that they spiked compared to the single MD and DVM. That I think now that will dramatically change now that we have a very explicit OH course it's not just a cursory lecture it's a core OH 3 credit course the understanding of what OH is fundamental to the MPH. In general, OH is a vet driven concept and has been from the get-go, …….*

Challenges to this perception occur in the School of Medicine where the administrative interviewee described in the section "Challenges" below did not agree there is a need at the institution where this research was conducted. He suggested that it is only through curriculum mapping to identify where OH content is taught that it can be suggested that there is a need for OH content in the MD curriculum. An MD faculty described that it does exist in the shared community clinics, but it needs to be improved. MD participants in both focus groups described the difficulty in defining interprofessional collaboration as effectively occurring between students or graduates commenting:

> ***MD FG2:*** *I think there's room for a lot of improvement … … … I do agree it's more the MPH DVM and MD MPH than the stand-alone that see the importance of it more than the others.*
>
> ***MD FG1****: We think we just have to teach content and IPE is really in principle should be way more than that …. and so its teaching that open -mindedness that inquisitiveness, willingness and ability to communicate across professions that we're not doing and we don't do it explicitly and some of us do it subtly in various ways but it's not a learning*

objective and everything in medicine is a learning objective. The other thing I was going to say it is needed because if you look at disease and disaster responses and WHO or PAHO workshops and committees … you need to be able to communicate and work together, so I think it's really important.

It was clear that faculty across programs saw the need for IPE but with a different emphasis. MD participants described the clear recognition by the American Association of Medical colleges for IPE:

MD FG1: I'll start so in the SOM; IPE is increasingly important it's in the AAMC standards and accrediting standards and its of growing importance and there are medical schools in the US but not many that do officially adopt IPE training ….

Faculty described the global relevance ranging from the impact of climate change and zoonoses on human health. Concern emerged that MD students neglected to consider the role of antimicrobial resistance, food safety, climate change and general animal related factors and were so focused on human health goals. Graduate school participants used the example of climate change, a key environmental issue addressed by the World Bank president and the need for collaboration to address key issues as this and zoonoses commenting:

Graduate School; Administrator FG1: …. World bank policies influence national policies …... I would agree with everything that has been said. There is a huge need …. I don't know if you saw the Lancet article this morning on climate change and how we lost 63 billion days of work because of heat stress. …. so, if you just allow them to explore what are the possibilities .., ..and how we put that in curriculum.

MD FG1: I do agree was very surprised that the antimicrobial resistance answer from the med students compared to vet students but across the board to relevance of OH is not shared by medical students ….

4.8.2. Theme 4 Opportunities for incorporating OH.

Many examples were provided ranging from simply introducing a lecture in shared classes at the institution to developing an OH track within the MPH. All MD and DVM MPH students are already exposed to IPE and OH (a core course) within this program as mandated by the Council on Education for Public Health (CEPH). An opportunity historically mentioned in the literature is the shared location of health professions programs on a campus for developing IPE as DVM participants reported:

DVM FG2: I think as it stands the IPE does not exist at SGU, but I think the advantages that SGU has is that both the Vet campus and Medical campus are on the same location so if it were to be developing it will be easier than most campuses.

Some other opportunities described included a range from having one shared seminar a term or simply making the current mention of OH relevant scenarios in the curriculum more visible as OH topics, to demonstrate its relevance to students:

MD FG 2: It can sometimes be as simple as just changing what you use as examples .... I try to have as many zoonotic examples as possible.

MD FG 2 and we already have research interactions where people are connecting across those disciplines so it wouldn't be so much of a stretch to decide let's have this and let's have it be something that's it isn't SOM or SVM.

Others described the use of case-based scenarios in shared classed at the institution as described by MPH participants or simply introducing one lecture on a topic of a zoonotic case relevant to both:

MPH FG1 My perspective is when I try to bring in a OH perspective using case scenarios that is where students can appreciate this but even when I did this the question…… .. …… but will require a consideration of contact hours, examinable content. …., I would suggest at least clinical scenarios students will finds a lot of value … …. .

DVM FG 2: through selective and electives so it's still part of your DVM and still part of your MD program but you are getting it introduced to students who actually have a passion for it rather than those who say I'm just going to stay traditional. .....

Other participants recommended the use of short courses in the form of selectives and electives, shared clinical projects between MD and DVM students. Yet other suggested offering a Masters in OH or a Track pathway in OH within the MPH as is done elsewhere and advertising this which could position the University as an international OH centre of excellence:

MD FG 2: you look around we have the OH scattered across the curriculum as we said so if we bring it into an elective or selective if you start small and get people interested then you can grow it into the MPH … or as a stand-alone OH Masters and with it you bring in our clinic which helps build a clinic aspect of it where you can have a practicum or a project or something where they work with the clinic so overall it works for the University we start it small as a prototype or trial.

4.8.3. Theme 5: Developing and implementing IPE/OH a challenge.

Most participants were reluctant to express commitment. DVM participants described a reluctance for faculty engagement in the absence of a mandate as faculty were already overworked:

> *DVM FG 2: I think overall faculty are already overloaded so giving them extra stuff will be demanding too much from them.*

The participants recommended more be done within existing and relevant courses for accentuating links to OH across the MD and DVM programs. In general, the consensus was that the greatest challenge to developing IPE /OH originated within the School of Medicine (SOM) program. They perceived that without an accreditation mandate, IPE development across the core curricula of the MD and DVM programs would not be supported by the University administration.

Specifically, the SOM does not perceive a need for IPE to occur with non-allied human health medical professionals. The Interviewee explained one would first have to identify if there was a need for OH in the core curricula. Based on the fact that it is not a qualifying examination or Board or accreditation requirement he suggested one could offer a selective or elective and also make areas already in the curriculum on OH more visible and that would be sufficient:

> *Interviewee: Then we are lucky to have a vet school here, so we can collaborate and do things together, but the assessment portion is an issue.*
>
> *Interviewee: well I think first you can do a Curriculum mapping both in Vet and Med to identify how much is being taught and mentioned right now. So……. That's about it*

These were aligned with the lack of variability of IPE in medical schools earlier mentioned by an MD participant!

> *MD FG 1: I think everyone already said it that the school already embraces it which is the same everywhere in the world, the vets get it and I don't see how the medical schools will get it. ….. …… now we are growing apart rather than together so I'm not sure whether we will get the SOM to embrace that as much as the SVM.*

In addition to the lack of a requirement by the medical accrediting agency for incorporation of OH in their curriculum, the general body language of the interviewee reflected the lack of importance ascribed to IPE involving veterinary students by the MD program stating that

Interviewee: If we don't do anything with Med -Vet, it doesn't mean we don't do a lot IPE because we do it with public health, nurses, physician assistants, in the medical school, the IPE it occurs in the clinical years when our students they have to communicate with all the health professionals in the hospital so medicine it was never in isolation. …., it doesn't mean that that applies to the vet.

But explaining the challenge to developing IPE across medical schools as there is:

MD FG1 : A lot of resistance in the curriculum to adopting it because no one wants to give up the time and because medical educators, physician medical educators and also medical students feel no, I want to be a doctor and I can't learn anything from a nurse or a vet so there's a lot of resistance.

This was relegated to the fact that OH is not mandated in the MD qualifying exams and hence MD students ascribe little importance to it:

MPH FG1: I think 1 reason is we have not really clearly built OH into our respective curricula. ……. At this point in their careers as an MD they are just concerned in getting through the boards that's all on your brain.

The MPH participants indicate their frustration in their non-verbal expression (*Head down and shaking hands in reference to MD students having a OH lecture)*. As the other MPH respondent mentioned who taught the one lecture previously given to the MD students in Term 3:

MPH FG1: It was related to human medicine but when BPM3 got restructured OH was no longer a part of the BPM3 ……

The Interviewee stated he was not aware that this lecture had been removed confirming the lower level of importance the MD program places on OH. Interestingly, in response to a suggestion that IPE initiatives are offered globally, the Interviewee replied demonstrating the lack of importance placed on IPE involving OH and non-human health aspects to IPE in the curriculum.

Interviewee: ……. but if that came out the lecture probably was replaced with a Directed Learning Activity. ……. One Health is minimal that we can assess, as a concept of OH now …. now the individual diseases we do them and vets they do their stuff, so we know if it's a pregnant woman you cannot have cats, that's about it

(Interviewer): This is not actually correct as there are situations where a pregnant woman is not at risk and this is what we clarify about owning cats for immunosuppressed owners in our Veterinary curriculum!

Interviewee: (Sits back in chair, shrugs and holds hands up) in response to adding OH to core SOM curricula. Quickly brushes off any need to do this or to offer shared classes between MD and DVM:

As the Interviewee explained, the University is directed at a US workforce and although we claim to offer an international education, the majority of the student population is directed at returning to practice in the US. He believed it was sufficient to introduce concepts to all and simply offer selectives and electives to interested students who could also get these opportunities by later selecting the appropriate residency commenting:

> Interviewee*: so, it will become very useful for a selected number of students to follow that type of sub specialization in the form of a Selective or elective in basic sciences, the OH. I think everybody should have a couple of lectures …, so they know so when you ask somebody about OH content, they know a concept, ……..*

He mentioned residency options and that many students prefer more lucrative options:

> *Interviewee: check for specific residency programs in the US or World …infectious disease programs……..deal with zoonotic diseases. Infectious diseases unfortunately are one of the lowest paid residencies, so, infectious diseases, paediatrics they are very low in the queue. So, student with very high scores they would try to go something far more lucrative.*

In response to whether the University is doing enough, he thought it was sufficient. However, when asked if there was a need for introducing IPE in the core Med and vet curriculum in order to operationalize a global approach to health practice he commented:

> *Interviewee*: …. *But if our vision or mission statement of the University is really that we want to match students in the US residencies. Yes, so we have a general mission and a national mission. National mission is that we have very successful medical students matching in US residencies*

He stated that change would require administrative decision making as:

Interviewee: That something, that the strategists of the University decide. Yes, we are more diverse we have Canadians and international. but still 75-80% go to the US, everyone wants to go to the US…

As earlier described, this study sought to inform the development of a proposed vision for the institution to execute its claim that it supports the OH philosophy directed at producing globally competent physicians and veterinarians. In the next section, a vision will be presented for assisting the institution to execute its claim to support the philosophy of OH.

4.9. Vision that Demonstrates Institutional Support for the OH Philosophy

Across programs there were suggestions that were drawn upon to consider what the vision would be for the institution to execute its claim to support OH. Most participants agreed OH was already in the School of Veterinary Medicine (SVM) mission as earlier described and a requirement for the MPH leaving the SOM with the main gap in lack of emphasis on IPE. The Interviewee suggested a general mission statement would resemble one "*aimed at producing globally competent graduates*". The Interviewee suggested the use of Kern's model for medical education described. Kern, Thomas, and Hughes (2009) developed a six-step strategy for developing medical curricula that include an assessment of needs, targeted assessments, development of goals, strategies for improving learning, implementing change and seeking evaluations and feedback. The rationale for this the interviewee explained was to determine if the University was doing enough to meet the demands of external stakeholders on introducing students to the principles of OH. He recommended that the vision could then be used to address insufficiencies as he commented:

Interviewee: Yes, but specifically Vet with med so you don't talk about One Health for everything … But if you do vet and Med you have to identify specific problems that you are creating a vision to address these problems

I made a suggestion that in the institutional mission we state we offer an international education. The interviewee highlighted that the vision statement would have to consider the focus of the administrators commenting that:

Interviewee: Right, but if our vision or mission statement of the University is really that we want to match students in the US residencies. Yes, so we have a general mission and a

national mission. National mission is that we have very successful medical students matching in US residencies

This illustrates the lack of clarity that may inhibit the institutional claim to supporting the OH philosophy as the US qualifying examinations for medicine do not require content knowledge on OH. In the focus groups faculty had other suggestions on how to explore inclusion statements for the vision. The MPH participants suggested that it was essential to include OH in the vision commenting:

MPH FG 1: ……. incorporate the word One Health or reflect it in the mission of the university which has to show things that reflect a truth. It's not necessarily OH but that interdisciplinary approach which will eventually translate into OH. ….

Another MPH participant described his discussion with an MD colleague a few days prior to these sessions where they discussed:

MPH FG 1: you don't have to put in word OH but that health is a shared experience and involves humans, animals and other creatures and the environment and a holistic view of health ….. that requires the involvement of multiple professions …… so when you come to do a DVM; MD; Dual degree; MPH or nurse at SGU you get this as part of it

Across the disciplinary groups the participants expressed that the vision should seek to attend to the gaps observed in the curriculum of the MD and DVM programs discussed in this study. Specifically, these were the lack of mention of antimicrobial resistance, the ongoing global health threats from Ebola, and external stakeholder recommendations for IPE that incorporates OH. These concerns culminated in a collective agreement that the vision and mission statement for the institution should include both *"something about an international education" and "blend it in maybe with Global Health" (DVM FG2) rather than One Health. As another (MD FG2) participant commented in agreement that "Global Health will cover everything so then it doesn't have to be just humans or animals.* "It was interesting that the MD participant did not recognise that OH does in fact include more than human and animal health components.

4.10. Summary

The results in this Chapter indicate the impact of gender, program of enrolment, prior public health experience and familiarity with OH on the readiness of students for IPE. Table 34

below relates the side by side comparison of quantitative data to the qualitative data findings. In summary, MD students scored the lowest RIPLS scores across several domains indicating the least readiness for IPE while the DVM MPH students had the highest RIPLS scores across several domains. The opinions of faculty across the schools including the MD program, conflicted with those of the interviewee of the SOM who did not perceive a need for IPE and OH between MD and DVM students. The absence of an accreditation mandate for IPE and OH within the MD program is the main challenge for obtaining administrative support for its development. The vision for the University was proposed by various faculty drawing on the evaluation of the comparative differences in student readiness for IPE and their opinions about the relevance of OH in the curriculum. The significance of the results summarized here, and connections made between the quantitative and qualitative data will now be critically explored in the next Chapter using the lenses of various theories.

Table 34

A Joint Display Relating the findings of the RIPLS to the Qualitative Data

	QUAN	QUAL		Integration
Program	RIPLS score	RIPLS Open Q	FG/Interview	MMR analysis
	Total Score			
DVM MPH MD DVM MD MPH	71.12 67.84 69.25 69.2	DVM MPH recognized the importance of human, animal and environmental health; Zoonoses; Policy; key human health issues missed by other groups. MD lowest scores overall and focus on human health mainly	DVM promotes OH. MPH incorporates gaps of MD and DVM programs and is IPE. MD students the least ready for IPE and lack understanding of OH	The overall RIPLS scores [QUAN] were highest for the DVM MPH students indicating the highest level of readiness for IPE. Most accurate understanding of all components relevant to OH. This was supported by the [QUAL] findings where Faculty discussed program of enrolment impacted student attitudes to IPE and OH
	Positive Professional Identity			
DVM MPH MD DVM MD MPH	17.29 15.42 16.02 16.62	DVM MPH, MD MPH perceived the importance of collaboration and other sectors to their practice	Lack of accreditation mandate for IPE and OH in MD. Lack of importance placed by interviewee on IPE with DVM. MD MPH higher scores than MD for Positive Identity and Teamwork demonstrating the importance of IPE as the MPH in their greater readiness for IPE	Focus group/interview results [QUAL] on the negative attitude of MD students to OH and lack of involvement in OH clinics support lowest Teamwork and Positive Identity scores for MD [QUAN]
	Teamwork	MD focus was on human health and collaboration with human health professionals		
DVM MPH MD DVM MD MPH	40.47 37.56 39.65 39.57			

Table 34 *(continued)*

A Joint Display Relating the findings of the RIPLS to the Qualitative Data

Program	RIPLS score	RIPLS Open Q	FG/Interview	MMR analysis
DVM MPH MD DVM MD MPH	Items 17-19 17: MD 3.42 DVM 3.47 MD MPH 3.70 & DVM MPH 3.71 18: MD 3.73; DVM;4.06; MD MPH 3.84; DVM MPH: 3.65 19: MD: 2.66; DVM: 2.75 MD MPH; 3.09; DVM MPH; 2.76	For the MD students, human health was a significant theme identified for them regarding their roles. These items previously located within the Roles subscale may indicate the students lack awareness of their roles as they have little clinical experience which will be offered in their final years of the program.	Faculty observed MD students were open to IPE and OH	The overall RIPLS scores for the MDs demonstrated their willingness for IPE and OH but the insights provided by faculty showed this was not realized in practice as it was not an indicator for accreditation of their program
DVM MPH MD DVM MD MPH	Negative Professional identity 12.47 11.33 12.14 12.41	All groups supported the idea of collaboration, but the MD students were the most focused on the aspect of human health within the concept of OH	Faculty observed MD students were open to IPE and OH but were not positive in practice as reflected in their aversion to the OH lecture conducted by the DPHPM faculty	The overall RIPLS scores for the MDs demonstrated the were the least ready to engage in IPE and OH which was supported by the insights provided by faculty. The rationale provided for this was the lack of accreditation requirements for OH and IPE in the MD program. A significant reason of the MD students' resistance to engage in IPE and OH is that it is not an examinable component of their qualifying exams. Thus, they view time spend on this as a distractant from more important things

Chapter 5: Discussion

This Chapter serves to critically evaluate the key findings of the study in seeking to address the research questions and to achieve the aims discussed in Chapter 1 using the lenses of various theoretical frameworks. The literature on student readiness for Interprofessional Education (IPE) and faculty attitudes about IPE commonly omits any discussion surrounding theoretical frameworks. In this Chapter, answers to the first and second research questions are provided through the lenses of Role theory, Social identity theory (SIT), and the Theory of Planned Behaviour (TPB). The Theory-Based stakeholder evaluation model (TSE) was used to answer research questions three and four. The origins of these theoretical frameworks are listed in Table 35 below.

Table 35

Theoretical Frameworks used in the study to address the research questions

Theory	Research question
Role Theory: Structuralist Perspective. (Merton et al., 1956)	1.What are the differences in readiness for IPE between medical, veterinary, and dual degree students?
Social identity Theory (Tajfel, 1974)	2. How do students of these programmes define the conceptual framework of One Health (OH) and its relevance in preparing them for health practice in the global environment?
Theory of Planned Behaviour (TPB) (Ajzen, 1991)	
Theory -Based stakeholder evaluation model (TSE) (Hansen & Vedung, 2010)	3.What do faculty perceive are the factors influencing student readiness for IPE, as demonstrated by the RIPLS results?
	4.What do faculty perceive are the opportunities and obstacles to developing IPE programs for producing globally competent health professionals?

Integration of the Data using the Theoretical Lens

The integration of data that is Step 11 of the 13-step approach to conducting a Mixed Methods Research (MMR) study, according to Collins et al. (2006), will be used here. Step 11 involves the integration of the data from the RIPLS and the qualitative survey data obtained from the student responses on One Health (OH). This will be followed by the integration of these findings with the data collected from the focus groups and interview. The current literature on IPE and OH omits to utilise theoretical lenses for explaining the factors that influence student readiness for IPE and faculty perspectives on IPE that includes OH. This study contributes to the literature on IPE and OH by using various theoretical frameworks for unpacking the factors that influence student readiness for IPE and for evaluating the faculty and administrator perspectives on the development of IPE that includes OH. First the lens of role theory will be used, to critically assess the findings obtained from integrating the RIPLS scores with the responses about OH to enable a comparison to be made about the students' perceptions of their professional roles across the programs.

5.1. Role theory

The structuralist perspective of role theory, as discussed by Merton et al. (1956), is used to guide the analysis of research questions one and two. In this study, the individual will refer to the student, and the social context refers to the institution or professional program. Further, some of the factors influencing the readiness of students for IPE were illuminated using the structuralist lens of role theory. A fundamental tenet of role theory is that the individual in this case the student perceives their professional role as tied to their social context (institutional/program) and the culture of their professional discipline.

As demonstrated in Chapter 4, medical students yielded the lowest scores for the reverse-scored items (17 and 19), as shown in Table 19. They agreed with statements such as "*the function of nurses and therapists is mainly to provide support for doctors*" (McFadyen et al., 2005) ,which seems to indicate that they are the least ready for IPE. Using a role theory lens, these results strongly suggest that medical students do not associate collaborative practice as an expected role responsibility of the physician. These results corroborate the findings of many studies such as De Oliveira et al. (2018), Hood et al. (2014), and Keshtkaran et al. (2014), who

suggest that Doctor of Medicine (MD) students perceive themselves as leaders of the healthcare hierarchy. This attitude would also explain their reluctance to participate in IPE.

Collaborative behaviours and attitudes are tied to the perceived role that students associate with the established cultural perceptions of their professional group within medicine and veterinary medicine, respectively. As Merton et al. (1956) explain, using a structuralist lens, the institutional context and the socialization process of medicine are linked to the expectation the student has of their future professional role. This view is consistent with those of Sollami et al. (2017) and Sollami, Caricati, and Mancini (2018) who discuss that the lack of readiness of MD students for IPE may be due to the high professional status that society and the culture of medicine ascribe to this discipline. Through the structuralist lens, there is no expectation by the institution or the program for MD graduates to engage in interprofessional learning as neither IPE nor OH is mandated by the United States Medical Licensing Examinations (USMLE) for medicine. MD students are thus 'forced' to view any attempt to build IPE and OH components into their learning experience as impediments to their ability to do well in their examinations. Ultimately, whether IPE and OH are going to be accepted by MD students will be driven by whether the USMLE makes the inclusion of IPE and OH within the MD curriculum, an examinable or licensure requirement.

As discussed in Chapter 4, the dual degree Master of Public Health (MPH) students, specifically the MD MPH students scored higher than the MDs on both of these items related to roles, as shown in Table 19, but expressed significantly higher disagreement with the statement, "*I have to acquire much more knowledge and skills than other health care students.*" The MD students in this study also had the lowest scores for Teamwork, as shown in Table 19, with the Doctor of Veterinary Medicine (DVM) students yielding higher scores than the MD students.

This study contributes to the literature on role theory and IPE as it provides a rationale for the observed differences in role expectations between the MD, DVM and dual degree MPH student groups. Role theory proposes that role expectations can change as the expectations of the social context (institution or program), alters its demands. The role expectation of the veterinary profession is tied to their oath to protect the public health, and with that, there is an expectation of collaboration with the physician. It was surprising to note this difference as across the UK and North America, the MD and DVM programs are the same length, but the socialization of the programs appears to be different despite the equivalent requirement for academically competitive

entrance requirements and course rigour. The DVM profession is accustomed to and aware and socialized to their responsibility to protect the public health and humans through zoonoses prevention. For this, they are aware and socialized of the need to collaborate with physicians and public health in reporting zoonoses and protecting owners, their staff, lab workers, and themselves from human health threats originating from animals. The MD student fundamentally does not perceive team working as an expectation of their professional role. The latter was revealed in their focus on human health within their definitions and descriptions of the relevance of OH.

The dual degree students yielded the highest scores for the teamworking domain, as shown in Table 19. From the structuralist perspective, the medical student and veterinary students view their future roles based upon their profession's rules that will impact their role. This may thus explain how the professional socialization process of the dual degree students differs from that of the single degree programs. The exposure of IPE that includes OH in the MPH program conveys that collaborative practice is an expectation of the future roles of the dual degree students.

As shown in Table 24, students that were familiar with the OH concept and had prior public health experience yielded higher readiness scores than students without prior experience. These results are consistent with the findings of other studies such as Curran et al. (2008), Hertweck et al. (2012), and Hood et al. (2014). However, this current study expands upon the findings of these published studies by the inclusion of the dual degree MPH student group. The inclusion of the dual degree MPH students in this research demonstrates how the exposure to IPE that occurs within the MPH along with extensive content on OH, promulgates positive attitudes towards IPE and a role expectation that embraces collaborative practice. These results are aligned with Merton et al.'s (1956) structuralist lens of role theory suggesting again that the socialization process of the MPH program tends to prepare students better to engage in collaborative practice as a necessary part of their role responsibilities. As reported by Francis (2013), poor teamworking skills in medical practice can lead to errors in patient care. These findings suggest that medical curricula in the preclinical stages may benefit from preparing students for an awareness of their roles as members of a healthcare team with implications for better patient care.

Michalec and Hafferty (2015), using the structuralist lens, discuss how IPE can create "role conflict" (p. 184) for students from professions such as Medicine, where there is no role expectation for interprofessional work. Michalec and Hafferty (2015) argue that this conflict

emerges from role stress (p.184) that is created for these students if they are mandated to engage in teamworking or interprofessional learning. The research findings of this study extend those of previous studies by the inclusion of the Dual degree student responses. The exposure that occurs within the MPH program through shared classes with other professional groups, potentially precipitates role adjustment (Michalec & Hafferty, 2015, p. 184). As a result of this, the dual degree students can better adapt to their expected roles in collaborative practice.

The notion of role expectations in role theory is evident in the student definition of OH and its relevance to their future practice. Across the MD and DVM programs, students incorrectly defined One Health and its relevance, but this was mainly the case with the MD and the DVM students. As an example, the MD students readily identified with the theme of human health within the framework of OH but omitted the role of animal health or environmental health in the concept.

These findings support the tenets of role theory that their own social group defines the expectations that medical students hold of their anthropocentric professional role. This view is supported by Rabinowitz et al. (2017), who discusses that current medical curricula fail to recognize the need to equip graduates with knowledge on zoonoses prevention and environmental health factors for practice. Inclusion of OH in IPE within the curricula of medicine is thus crucial to prepare graduates for offering improved care to their patients.

Role theory proposes that the social or program context defines role expectations. As shown in Chapter 4, while the theme of human health was also crucial for the MD MPH students, their broader definition of the concept of OH reflects the centripetal positioning of OH that underpins the MPH program. Dual degree students, as shown in their responses, were aware of their role in health policy formation. This suggests that incorporating an MPH into their education expands their perception of what their role expectations should resemble, both as clinicians and concomitantly as public health professionals.

Role theory suggests that the future graduate should know how to act or perform their roles when they are conscious of their role expectations (Qian et al., 2018). Although many studies discuss the gaps that occur in the MD and DVM curriculum as it pertains to IPE and OH, this study extends the findings of others by providing insight into the specific nature of these gaps as revealed by the student responses about OH across the programs. While the DVM students frequently mentioned specific zoonoses of concern it was noticeable that for the MDs

specific zoonoses of global health importance were absence in their responses about OH. None of the MDs mentioned specific zoonoses of global relevance that should have immediately come to mind such as Ebola, anthrax (a key bioterrorism agent) or relevant vector borne diseases such as West Nile virus. The DVM students readily recounted the importance of specific zoonoses such as *"Leptospirosis", "Lyme", "rabies" and "tick-borne illnesses."* With the increasing occurrence of immunocompromised patient populations such as the elderly, AIDS patients and those with neoplastic conditions, physicians should expect to play a key role on accurately advising clients on the choice of a suitable pet to minimise zoonoses occurrence while promoting the mental health benefits provided by human -animal bonding. Most of the MD respondents did not mention the role of the human-animal bond within the concept of OH, which is associated both with improving human mental health through companionship as well as improving the recovery of human patients.

The DVM and DVM MPH students were aware of the risks of two critical issues to human health: foodborne diseases from products of animal origin and antimicrobial resistance. On the other hand, neither the MD nor MD MPH students mentioned foodborne diseases and antimicrobial resistance as relevant to OH. Key issues that that should feature within the ambit of MD students for example, antimicrobial resistance and food safety were omitted from their responses in defining OH. This aligns with the previous findings from other studies such as Rabinowitz et al. (2017) and Togami et al. (2018) whom both found that MD students were unable to identify with specific public health issues like antimicrobial resistance that properly fall under their purview and role responsibility. The absence of the medical student's recognition of their role in tackling global public health issues as antimicrobial resistance and foodborne diseases on health suggests that more needs to be done within the core curricula of each discipline. This is crucial if MD and MD MPH graduates are to fully comprehend and competently deliver their roles as medical practitioners in the global environment of health practice.

The MD students seemed unaware of the impact of global warming on the rise of vector borne diseases, the occurrence of heatstroke and respiratory diseases and allergies on their patients through a lack of mention of these specific conditions in their responses. The impact of global warming provoking the occurrence of natural disasters and flooding leading to human

displacement and refugee migration with resulting mental health issues were completely omitted from the MD student responses about the relevance of OH to their practice.

With the United Nations (2019). listing goals such as attainment of clean water supplies, no hunger with implications for food security, optimal health of life on land and within marine environments, partnerships for achieving goals, and climate change on its Sustainable Development agenda for 2030, it was striking that MD and DVM students seemed unaware of the relevance of these key global health areas to OH and by extension to their roles in clinical practice.

As is consistent with gaps described in the previous literature, the DVM students, often omitted to consider the role of the environment in the health of either animal or human health. Although OH is taught within the veterinary curriculum, Schwind, Gilardi, Beasley, Mazet, and Smith (2016) observed the lack of student awareness of their role in preserving ecosystem health. The latter is also consistent with a study published by in a study on veterinary students and their understanding of OH at this institution by Roopnarine, Younger, Mossop, and Rodrigo, (2018), where there was no mention of the role of the environment in OH. This study expands on these findings by revealing the specific gaps in the DVM student responses as the DVM respondents failed to mention the impact of climate change and global warming having implications for heat stroke in animals. None of the DVM respondents seemed to be aware of the impacts of global warming on the marine environment or the impacts of anthropogenic habitat destruction leading both to loss of biodiversity as well as bringing humans into closer contact with wildlife reservoirs of zoonotic diseases. There was no consideration of the influence of social and behavioural or cultural factors on zoonoses occurrence by the DVM respondents.

Given the current climate of global health, it was surprising that students did not mention the importance of social, cultural and behavioural factors such as bushmeat consumption on the occurrence of Ebola or the spread of highly pathogenic avian influenza viruses causes by close contact between humans and domestic poultry in rural global environments. Importantly, there was little mention of the impact of global warming on the spread of vector borne diseases. The latter are all areas that reveal a gap in the DVM curriculum about the student's awareness of the relevance of OH as it pertains to the impact of environmental, social, behavioural and cultural factors on the occurrence of globally important zoonoses and their role in mitigating these risks to the public health. Taken together, these results recommend the inclusion of environmental

health content in the DVM curriculum. These findings suggest the culture of the professions must change. In order for this to occur the curricula of these two disciplines can benefit from including IPE that includes content on OH.

Role theory proposes that roles are defined by the social structure of the disciplinary context. This study through the inclusion of the dual degree students again provides a novel insight into how the content of the MPH curricula closes gaps on specific environmental health knowledge that is evident within the MD and DVM programmes. For the DVM MPH and MD MPH students, the role of the environment in the OH concept was recognized as necessary, suggesting that there is an expectation among these students to link environmental health content to their practice. This view is supported by Marselle et al. (2018), who discuss the benefits of public health education, proposing that public health education enables students to consider the multifactorial causes of disease, thus promoting efforts to minimize climate change.

The results from this study indicate that the MD students are socialised to their roles as being human health professionals without any expectation to engage in interprofessional practice. Michalec and Hafferty (2015) discuss the processes of socialization that occur within each of the programs of the health disciplines that have led to the development of discipline- specific identities and professional roles. Role theory proposes that role stress occurs when roles become unclear, according to Brookes et al. (2007). IPE that incorporates OH provides the opportunity for "role blurring," according to Michalec and Hafferty (2015, p. 185), to occur, which is a necessary transitory phase enabling role adjustment for students across disciplines to work collaboratively to identify health issues that plague all sectoral platforms. The current study found the dual degree students to be the professional group that most frequently correctly defined the concept and broader relevance of OH across the three sectors the concept represents. Further, the results of this study support the idea of Hayes et al. (2014) that the dual degree program provides a platform for evaluating how IPE that includes OH can be developed for the core MD and DVM curricula.

Elsous et al. (2017) suggested that role theory could be used to evaluate how gender may impact perceived roles. Females yielded significantly higher scores than males on Teamwork and Positive Professional Identity, as Table 20 shows indicating a greater readiness for IPE. These findings are in agreement with several other studies for example Bar et al. (2018); Guinan et al. (2018); Talwalkar et al. (2016); Visser et al. (2017); Wilhelmsson, Ponzer, Dahlgren, Timpka,

and Faresjö (2011). As is consistent with role theory, individuals perceive their role expectations based upon their social group, in this instance, gender. As earlier described by Bell et al. (2014) and Wilhelmsson et al. (2011), the greater readiness of females than males to interprofessional learning may be explained by the positioning of men in more senior role positions than females. Based on these predictions, males with their higher social status than females would be more reluctant to engage in IPE, which requires team working and therefore, would score lower on the team work domain, as was found in this study.

As is consistent with the tenets of role theory that proposes that role expectations are linked to those of the social context, the readiness of students for IPE and OH in this study are linked to the expectations of their professional program. On its own, role theory was not a robust enough framework to explain the readiness of students for IPE. Thus, Role theory was used along with the theoretical framework of SIT for explaining the differences in readiness for IPE across the student groups in this study.

5.2. Social Identity Theory (SIT)

This theory will be used to explain how professional identity, one manifestation of social identity, can influence how students differentiate themselves from other disciplinary groups. This has implications for student readiness for interprofessional learning. SIT has been used within medical education to assess the link between the multiple identities an individual learner can hold of themselves' and their concept of one expression of their social identity, their professional identity (Burford, 2012).

Social identity manifested as Professional identity can lead to negative stereotyping of other groups based upon the socialization process of the discipline. There were statistically significant differences found between the MD and MD MPH student groups, with the MD MPH students scoring significantly higher on Positive Professional identity, as shown in Table 19. This finding is consistent with the observation of others such as Sollami et al. (2017) that posit that historically those pursuing only medicine perceive of themselves as being of a higher status and thus making them more reluctant to engage in IPE with others. This study through the determination of the RIPLS scores that indicates the greater readiness of the MD MPH students compared to MD students for IPE extends the findings of studies that explain the rationale for the

lower RIPLS scores of the MD students. The inclusion of the dual degree MPH students in this study illustrates how the gaps in the curriculum of the MD and DVM students pertaining to IPE and OH can be bridged through exposure to shared classes with other professional groups and specific OH content as occurs within the MPH.

The dual degree students yielded the highest scores in the domain of Positive Professional identity (Table 19). The DVM students had the highest scores for item 18 indicating they had greater clarity than other groups about their professional roles, along with the highest scores for the Positive Professional Identity subscale. As Table 24 shows, there were also statistically significantly higher Positive Professional Identity scores for students with prior public health experience than those students without prior experience as is consistent with the findings of Hertweck et al. (2012). The perspective of SIT provides a lens for understanding intergroup relations and how the social context of the single degree students, particularly the medical students, differ in their perception of other professionals. This has implications for differences in the readiness of students for IPE and OH. The socialization process of the dual degree program that provides exposure to IPE and OH through the MPH degree appears to reduce the negative stereotyping of other groups and promotes readiness for interprofessional learning.

Keshtkaran et al. (2014) argue that professional identity assesses the value students ascribe to shared learning with a high score indicating the ascribed importance placed on learning with other groups. According to Sollami et al. (2017), SIT posits that the professional identity of the student is associated with the professional culture of their discipline. A core tenet of SIT is that the professional identity, which is one part of the social identity originates from the individual's identification with their professional group (Burford, 2012). The latter may explain the striking results shown in Table 25, where students that were familiar with the principles of OH yielded statistically significantly higher scores for Negative Professional Identity. This result indicates that students familiar with the concept disagreed with statements averse to IPE. Taken together, these results can potentially be explained by two factors. First, it may be that these students developed a value for shared learning that they developed through their prior public health exposure. Some of the MD, DVM and dual degree students were involved in the campus community OH clinics, whereas others had completed an MPH or had some other public health experiences before their enrolment in the MD or DVM programs. Secondly, it may be explained by timing the survey in relation to the stage at which the students are in their program. MD and

DVM students are in the advanced stages of their program by the time they are in Term 5 and the latter may have accounted for their development of a more mature Professional identity. Both groups have had some exposure to OH related content that may explain their appreciation of the relevance of collaboration across the professional groups for clinical practice. In the case of the MD student, the introductory lecture to OH they have in Term 3 and the Veterinary Public Health and Epidemiology course that the DVM students complete in Term 4.

As earlier mentioned by Burford (2012), SIT links the development of professional identity to readiness for IPE. According to Armitage-Chan and May (2018), temporal development of professional identity is consonant with the enunciations of Perry's (1968) framework and Nyström's model (Nyström, 2009). As students' progress through their degree programs, their readiness for IPE emerges through their ability to negotiate their identity to the demands of their context (institution or program) and the types of role modelling they receive from faculty and peers. This study expands on these previous findings through the inclusion of the MD MPH and DVM MPH student groups. The higher Positive Professional Identity scores obtained by the dual degree MPH students suggests that not only the stage of the program but the relevance and type of exposures provided by the shared learning environment may positively impact the cognitive development of the student preparing them for a greater readiness for shared learning than the MD and DVM student groups.

The status of the professional group is a key concept within SIT (Sollami et al. 2017). As shown in Table 19, the medical students had the lowest Negative Professional Identity scores, as is consistent with the findings of other studies such as Morison et al. (2004). These findings suggest that high- status disciplines such as medicine, which associate with their inner group, are less likely to be ready for collaborative education. The DVM MPH group had the highest overall, Teamwork and Positive Professional Identity scores, as Table 19 shows, suggesting this group were the most positive about IPE. The latter is in agreement with Hind et al. (2003), who similarly observed that medical, nursing, dietetics, pharmacy and physiotherapy students that had a high professional identity, had greater clarity about their professional roles that appeared to precipitate a readiness for IPE. These findings contradict the assumptions made by Aziz et al. (2011), who suggest that professional identity may impede a readiness for IPE. Through the inclusion of the dual degree students in this study, these findings can be further explained by connecting the theoretical frameworks of role theory with SIT illustrating how this study expands

upon the findings of others in the literature. The dual degree students yielded the highest Negative Professional and Positive Professional Identity scores, as shown in Table 19, indicating that they have a mature professional identity that broadens the concept of their role responsibilities to include a collaborative approach to practice.

As SIT proposes that professional identity is derived from the perceived status of a group and their socialisation process, Sollami et al. (2017) propose that IPE challenges the established status of single disciplinary groups. This may explain the contradictions of the findings of this study to previous studies that report the gaps in the environmental (Chaddock, 2012) and zoonoses education of MD students (Marcotty et al., 2013). As found in this study, there was a clear recognition that some MD students had for the role of the environment and their role in collaborating with the DVMs for minimizing zoonoses. A potential explanation for this is that the MD students in this study received one lecture in One Health (the lecture has now been removed) by the MPH faculty that would have exposed them to the importance of environmental health.

Sollami et al. (2017) purport that IPE disrupts the social hierarchy of the single disciplines and accordingly removes the power status ascribed to some disciplines such as medicine. The results of this study extends on these findings on how this power hierarchy can be dissolved through the inclusion of the dual degree MPH student responses and the theoretical framework of SIT. Using the lens of SIT, the exposure to IPE/OH and the socialization that occurs in the MPH program has broadened the dual degree student's professional identity beyond the primary role of an MD or DVM. This may explain the more comprehensive perspective of the dual degree students about their roles beyond that of human health care as it pertains to the consideration of the role of social, cultural factors and environmental conditions on the public health.

Khalili et al. (2013) advocate the need for students to develop both a "uniprofessional" (p.448) and an "interprofessional identity" (p.448). The wider perception of the professional identity of the dual degree students approaches an interprofessional one and may influence their perceptions of their role responsibilities. These findings support the value in exposing MD and DVM students' to IPE and the principles of OH. In the next section the Theory of Planned Behaviour (TPB) will be discussed as it pertains to how the students' perception of their professional role and professional identity predicts their intention to engage in IPE.

5.3. Theory of Planned Behaviour (TPB) (Ajzen, 1991)

Roles are linked to behaviours and identity, and thus, the influence of role theory and identity theory will be used to extend the TPB and to explain the findings of research questions one and two (Terry et al., 1999). The TPB theory posits that the learner's intention to engage in an action or behaviour is influenced by their attitudes about the action, perceived social norms, and perceived behavioural control, according to Ajzen (2002). In this study, I sought to use the TPB to link students' readiness or attitudes to IPE to predict their intention to engage in IPE. Students that perceive their professional roles as incorporating a commitment to collaborative practice are likely to be more engaged in IPE. Similarly, as professional identity is linked to the values and professional behaviours of the disciplinary culture, students that are acculturated to IPE are likely to engage more readily in IPE. As discussed in Chapter 2, the third variable of perceived behavioural control was not measured in this study.

In this study, the behaviour pertains to the readiness of the student to engage in IPE. The subjective norm relates to the social pressures such as accreditation mandates for the disciplines of medicine and veterinary medicine to include IPE that includes OH in their curricula. As earlier discussed in Chapter 1, there are no accreditation mandates for the inclusion of IPE and OH in the MD or DVM programs. However, the CEPH (2016), the agency that accredits the MPH program, mandates both IPE and OH for students pursuing the MPH degree, which includes the dual degree MPH students recruited for this study. In this study, it is plausible that the differences in readiness for IPE may be influenced by whether students link participation in IPE as a moral obligation (Godin et al., 2005) that will enable them to provide better care of patients. The variables of behavioural attitudes and subjective norms as components of the TPB, will now be used to illustrate how these variables influence the students' intention to engage in IPE and OH.

5.3.1. Behavioural attitudes: readiness for IPE

Behavioural attitudes, as defined by Ajzen (1991), are used here to indicate the readiness of the students across programs for IPE. As found in this study's findings, the DVM MPH students had the highest overall, Teamwork score and Positive Professional identity scores. These findings suggest that these students are the readiest for interprofessional learning. The MD students had the lowest scores for Teamwork and Positive Professional identity, as is consistent

with the findings of Judge et al. (2015) and Kesktakaran et al. (2014), who also found that MD students were the least ready for IPE.

The MD students had the lowest scores for Negative Professional Identity, indicating that they gave the least support for shared learning amongst the groups, as Table 19 shows. This is consistent with the findings of Wong et al. (2016), who found that medical students were the most averse to IPE. This is also supported by the findings of Aziz et al. (2011), where MD students perceived their roles as requiring more knowledge and skills than other groups and the roles of nurses and therapists to support them. This confirms that MD students feel a superiority to students from other health disciplines. The concurrent qualitative phase of this study that sought to explain how students across programs define OH may explain this difference between the groups.

As is consistent with the TPB element of behavioural attitudes, the key theme for many MD students when asked to describe the relevance of OH was human health. As demonstrated in the student responses in this study, many MD students omitted to mention the role of the environment or animal health in their concept of OH, and many DVM students did not mention the role of the environment. Overall, these survey results indicate that the behavioural attitudes of the MD students as being the least ready for IPE. They are also less familiar than other groups with the concept of OH.

5.3.2. Subjective norms: perceived pressure to engage in IPE

The second variable associated with the TPB is that of subjective norms (Ajzen, 1991). Subjective norms are considered to be the social pressure on the student to participate in IPE and OH. In this study, the subjective norms relate to what the program accreditation requirements are for IPE and OH. As earlier described, the disciplines of medicine, veterinary medicine, and public health differ in their requirements for IPE and OH education. The latter is mirrored in the comparative differences in RIPLS Scores across the programs as well as the emphasis placed on student definitions of OH.

As is consistent with this second element of the TPB, there are no social pressures for MD students to engage in IPE. This may explain why the MD students yield the lowest RIPLS scores amongst the programs as Table 19. The perception that OH is about providing optimal human health reflects a lack of importance that many MD students place on animal and

environmental health, as highlighted by Courtenay et al. (2014). The MD program is the only program where there is neither an accreditation requirement for OH education (there is for the MPH program) nor a history of an OH philosophy (which is in the DVM oath and mission). This is also consistent with the opinions of faculty who had previously taught the one OH lecture to the MDs. The MPH faculty reported that they had received negative post-course evaluations from MD students who did not consider this concept as relevant, given that OH is not a requirement for the qualifying examinations.

The lack of social pressures to engage in IPE that are aligned with the subjective norms for medicine are also linked to SIT theory and Role theory. Martimianakis, Maniate, and Hodges (2009) argue that the medical profession is known to be associated with a high-power status, and aligned with this, is that the cryptic components of the hidden curriculum sway the student's professional identity. Goldie (2012) and Michalec (2012) suggest this promotes this separatism from other health professional groups.

The lens of SIT explains how the culture of the discipline influences the professional identity of the medical student. Drawing on the tenets of role theory, the expectations of medicine influence the role expectation of the future physician and veterinarian. The hidden curricula of the traditional medical program appear to create a social disconnect between the medical profession and other groups. Michalec (2012) discusses this occurs through the promotion of the superiority of the medical professions aligned with their responsibility and knowledge for optimizing human health.

The findings of this study expand upon those of others in the literature as it pertains to illustrating how the concept of professional identity and role theory expands the framework of the TPB in critically exploring the readiness of students in this study for IPE and OH. The findings of this study expand upon those of others in the literature as it pertains to the role of subjective norms on the students' intention to engage in IPE. Specifically, the requirement of the MPH that mandates the development of interprofessional values and the completion of a core course in OH that precipitates the readiness of the dual degree MPH student for IPE compared to the MD and DVM students. The MD students were found to have behavioural attitudes consistent with being least ready for IPE. This, coupled with the lack of social pressures to engage in IPE, indicates that MD students as a group are likely to have the least intention compared to other students to participate in IPE and OH.

Dallaghan, Hoffman, Lyden, and Bevil (2016) report the sparsity of information on faculty attitudes towards IPE. Specifically, no articles were found evaluating the attitudes of veterinary and public health faculty to IPE. The themes that emerged from the focus groups and interview will be evaluated using the Theory- Based Stakeholder Evaluation (TSE) model discussed by Hansen and Vedung (2010) in answering research questions three and four.

5.4. Theory -based Stakeholder Evaluation (TSE) model (Hansen & Vedung, 2010)

Suter et al. (2013) discuss that necessitating organisational change, such as IPE development requires the input of all institutional stakeholders. This theory underscores the assumption that IPE development requires stakeholder input. The TSE couples a stakeholder approach with the framework of program theory (intervention theory) to analyse how the key internal stakeholder faculty groups evaluate the opportunities and challenges to developing IPE.

The three elements of the TSE model by Hansen and Vedung (2010) includes (1). Situation theory, (2) Normative theory, and (3) Causal theory that will now be used to analyse the faculty and administrator responses to answer research questions three and four.

5.4.1. Stakeholder situation theory: The problem.

Situation theory reflects the problem the faculty identify that IPE that includes the principles of OH is designed to address within the institution where this research was conducted. The faculty responses revealed their observations that the MD students yielded the lowest scores and were often inaccurate in their very anthropocentric definitions of OH. The findings from this study concur with those of Hayes et al. (2014), who report that many healthcare students fail to mention animal or environmental factors in the concept.

The lens of situation theory reveals the issues that IPE that includes OH should address. The faculty responses in Chapter 4 showed that they saw two potential problems requiring redress: the MD student gaps in knowledge about food safety and antimicrobial resistance and secondly the overall omission of climate change and its effect on health by the MD and DVM students. According to Maxwell and Blashki (2016), MDs must be competent in tackling the mental and physical effects of health posed by climate change. Zinsstag et al. (2018) argue that the lack of environmental health awareness and education occurs in the curricula of both the MD

and DVM programs. The faculty agreed there was a need for developing an IPE intervention that included OH for tackling gaps identified in the MD and DVM curricula earlier discussed.

Using the framework of situation theory, the analysis of faculty responses in this study showed that while faculty agreed IPE and OH were occurring in individual pockets of the programs, there was a need for expansion of these across the MD and DVM programs. Several mentioned that IPE is more than a focus on content and that more should be done to promote the essence of IPE, such as a curiosity to learn and a capacity to communicate and work across the professional disciplines. This was further supported by the observations which the faculty made about the greater readiness of the dual degree students for IPE, which they attributed as being due to their exposure to the MPH degree. Faculty noted that the dual degree students had a more comprehensive understanding of issues such as antimicrobial resistance and climate change, which was typically omitted by the single degree students.

The situation theory framework highlights the views of the stakeholders on the problems IPE that includes OH should address. The view of the interviewee of the School of Medicine did not concur with that of the faculty as he did not perceive the current situation as indicating a need for IPE that included OH for the MD students. The responses of the interviewee and the faculty serve to show that while there may be a need for IPE that includes OH in the MD program, lack of an accreditation mandate coupled with lack of administrative support for OH would deter its development. Normative theory is the second component of the intervention theory framework that predicts the benefits of an IPE intervention and is discussed next.

5.4.2. Stakeholder normative theory: The benefits of an IPE-OH intervention.

Faculty perceived the benefits of the IPE/OH intervention as enabling closure of the specific gaps identified in this study to enable students to operationalize OH in their future practice. The specific gaps in the curriculum identified in this study that were discussed, pertain to the following discussed in the abstract of this thesis: global warming and its impacts on health; the impact of antimicrobial resistance on health; the effects of foodborne issues of animal origin impacting the public health; the socio-cultural and environmental factors leading to the emergence of zoonoses with implications for human and animal health and the role of the human-animal bond and human mental health.

Several studies for example, Courtenay et al. (2014) and Rabinowitz and Conti (2013), support the development of IPE that includes OH for students across the health disciplines aimed at optimizing the health of animals, humans, and the environment they share. Using the lens of normative theory, the faculty responses in this study showed that they noted the greater readiness of the dual degree students for IPE and the accuracy of their responses on OH. They associated this with undertaking an MPH that provides OH exposure increasing their preparedness for global practice. The lens of normative theory also demonstrates that faculty felt that developing IPE that includes OH could provide opportunities for more collaboration in teaching, research, and for optimizing clinical care through advancing the knowledge of each profession. Causal theory is the third component of the intervention theory framework that will now be used to discuss the preconditions for developing effective IPE that includes OH.

5.4.3. Stakeholder causal theory: Preconditions for developing effective IPE-OH.

Causal theory highlights what the key stakeholders perceive as a requirement for developing effective IPE that includes the principles of OH. The faculty and other interviewee suggested that curriculum mapping and challenges to developing IPE had to be tackled. In looking through the lens of causal theory, stakeholder faculty and administrators discussed the need for curriculum mapping first to identify where OH occurred as crucial for deciding where coverage was inadequate in the curriculum. Several challenges were identified, including developing methods to conduct a proper assessment of IPE that included OH and concerns regarding faculty overload as well as the time, skill, and effort required to curriculum mapping. Several studies, for example, Bennett et al. (2011), express similar challenges for obtaining faculty support for developing IPE. The opportunities for developing IPE that were revealed during the focus group discussions illustrated how some of the challenges to IPE implementation could be addressed. The latter will be discussed in greater depth under recommendations in the next chapter.

Taken together, the various elements of the TSE provides insight into the current needs of the MD and DVM programs about IPE that includes OH, the prerequisites for developing the intervention, and its perceived benefits for the future MD and DVM graduates. One primary concern is that in the absence of an accreditation mandates for IPE that included OH for the MD program, there is currently no administrative support for it despite the identified needs and

benefits discussed here. This view was the consensus of the faculty and the interviewee that participated in this study.

5.5. Summary

This Chapter, underpinned by various theories, addressed the research questions presented in this study. An examination of the study findings through the lenses of role theory, SIT and TPB suggest that the culture of the disciplines is a fundamental reason for the comparative differences in readiness for IPE and familiarity with OH that occurred across the groups. The inclusion of the dual degree students in this study has provided a significant and original contribution to the literature on IPE and OH through an evaluation of their readiness scores and responses about OH. The latter reveals how components of the MPH curriculum depict how specific gaps in the curriculum of the MD and DVM student identified in this study, can be closed.

The exposure to the MPH and the social environment and culture of the program appeared to positively influence Professional Identity and role behaviours in favour of IPE and collaborative practice. The latter was evident as revealed by the specific gaps in the student responses about OH across the programs, that further illustrates how this focused study provided insights that provide further specificity about the nature of the gaps pertaining to IPE and OH than has been identified in other studies. This study uses the lenses of role theory, SIT and TPB to explain how the specificity of the gaps identified in this study influences the students' perceptions of their professional role and professional identity and thus intention to engage in IPE and OH.

There is a sparsity of literature on faculty and administrator perspectives pertaining to the development of IPE and OH initiatives. The TSE framework enabled answers to be provided from the faculty data on the factors that could influence the development of IPE that includes the principles of OH, such as the program of enrolment and accreditation policies. This focused study provides a unique contribution to the existing literature on IPE and OH by engaging a diverse group of faculty and administrators across different health professions in a shared discussion about the factors influencing the readiness of students across the programs for IPE and for developing IPE that includes OH at this institution. The critical discourse that occurred in these sessions resulted in a positive dialogue that enabled the diverse perspectives of key faculty

and administrators across three health professions programs to be shared for informing the development of IPE and OH at the institution where this research was conducted.The thesis concludes in the next Chapter with recommendations for practice arising out of the findings of this study.

Chapter 6: Conclusion

In this Chapter, I will discuss the significance of the findings obtained from this study in order to provide recommendations for practice and future research. I will also expand on the limitations of this study discussed earlier in the Methodology Chapter. This Chapter will conclude by discussing the original contributions of this research to knowledge. This study set out to achieve four aims: (1) to explore the readiness of Doctor of Medicine (MD) and Doctor of Veterinary Medicine (DVM) students who have no prior Interprofessional Education (IPE) experience for IPE that incorporates the principles of One Health (OH); (2) to explore the effects of prior IPE and OH exposure on the readiness of Master of Public Health (MPH) students for IPE incorporating OH; (3) to explore the perspectives of the faculty and administrators on the opportunities and challenges for developing IPE that incorporates OH for the core MD and DVM programmes and (4) use the information gleaned in this study to inform the development of IPE that promotes the concept of OH. These aims were used to develop a vision for the University to deliver its claim to support the philosophy of OH. Within this Chapter, I use the remaining two steps of Collins et al's (2006) Mixed Methods Research (MMR) framework introduced in Chapter 3. These steps are as follows: To provide a report from the MMR findings in Step 12 and a reformulation of the research question in step 13, as discussed below.

There are three outcomes to this study. One, more in-depth insight that has been gained into the factors that influence the differences in the student's readiness for IPE across programs through the inclusion of the dual degree student population. The inclusion of the latter group has provided insight into how the MPH curricula content better prepares the MD and DVM student for appreciating the value of shared learning, and by extension the benefits of collaborative practice. The second outcome is the evidence provided on the specific nature of the gaps in the student's knowledge about OH that extends upon the findings of other studies with implications for informing changes to the MD and DVM curriculum. The third outcome is the valuable insight provided into the decision-making faculty and administrator perspectives, for informing the development of IPE that includes the principles of OH at the institution where this research was conducted.

Although this study has occurred within a very particular context, the issue of developing IPE that includes the principles of OH is applicable at medical institutions worldwide. I make this claim based on the analysis of my findings within the background of

the current literature on IPE and One Health. Similar challenges to developing IPE that include the principles of OH exist elsewhere. So are the rising expectations of external stakeholders for educators to familiarise future physicians and veterinarians to the principles of OH in order for them to effectively address current threats to global health. In the next section, the recommendations for practice arising out of the findings of this study will be discussed.

6.1. Step 12: Report from the MMR findings and Recommendations for Practice

Before this study, it was difficult to make predictions about the readiness of MD students for IPE and their understanding of OH. The findings that have emerged from this study have shown that the specific gaps in the curriculum of the MD and DVM programs that need to be addressed. The research has also provided knowledge obtained from the faculty and administrator perspectives on the factors that will impact the development of IPE that introduces students to the principles of OH at this institution. The recommendations for practice address four areas discussed below: the curriculum, leadership, the development of communities of practice, and a vision for the institution.

6.1.1. Curriculum.

The comprehensive responses and high readiness scores of the dual degree MPH students provide support for the importance of curriculum development as a cornerstone in influencing the impact of IPE that includes OH. Importantly this group grasped the importance of animal and environmental health independently of their impact on public health. The latter suggests a more extensive exposure to OH is provided within the MPH program and that the occurrence of interprofessional learning with other groups has prepared them for readiness for collaborative practice. There is also evidence in the responses of the MPH Students that they have been exposed to curriculum content on the social, behavioural, cultural, and environmental factors that impact public health. It is evident in their understanding of the role of environmental factors specifically, climate change and foodborne diseases of animal origin, on public health. These students understand the principles of policy formation for impacting health care reform at the population level.

The findings in this study indicate a need to incorporate content on environmental health, health economics, and policy formation within the MD and DVM curricula. Specifically, the impacts of climate change on the environment, animal health, and human

physical and mental health need to be incorporated within the curriculum of the MD and DVM programs and tailored to address the gaps identified in this study that have provided further specificity about the nature of these gaps than has been identified in other studies. The curricula should include strategies for decision-making in formulating health policy that will enable graduates to understand the economic and political forces that impact policy formation. This is crucial if they are to assist in formulating health policies that will positively impact their patient population.

This work has provided expanded insight into the nature of specific gaps in the MD curriculum which include key human health issues such as antimicrobial resistance, and foodborne illness arising from products of animal origin. The MD curriculum would benefit from incorporation of content that enables the MD graduate to recognise their role in attainment of UN specific goals for achieving its 2030 sustainability agenda as it pertains to food security and climate change. Provision of curriculum content on the threats to health from antimicrobial resistance and foodborne illness is crucial for preparing the future physician for their role responsibilities in tackling these issues. The use of active learning strategies that are used for IPE delivery is the most effective way for our students to understand their role in antimicrobial stewardship. This view is supported by others, such as King, Hand, Stover, and Bland (2018). Additionally, this will enable our future physicians and veterinarians to gain clarity on their role responsibilities in tackling global health issues.

Faculty expressed that while OH content is covered somewhere across the programs, considerable efforts to highlight existing lecture content on zoonoses and environmental issues are required. Specifically this study and the specific nature of the gaps revealed here, suggest that faculty should ensure that medical students recognise their role in being able to apply their knowledge on specific zoonotic diseases of global importance. MD students should be better prepared to apply their knowledge about diseases such as rabies for advising on correct post exposure prophylaxis. It was surprising that the administrator of the medical school thought that simply advising pregnant women to avoid owning a cat was thought to be the only option to prevent the occurrence of Toxoplasmosis. A dialogue with a veterinary colleague could provide broader insight into minimising the risk to the pregnant patient from Toxoplasmosis ,through advising the patient to obtain assistance for disposing of litterbox waste that would not required her to disown her pet. Curriculum content should provide the MD student with the awareness of the role of the human-animal bond on preservation of human mental health through the need for companionship that is provided particularly to elderly patients and those recovering from medical and surgical treatment.

Importantly, while other studies have revealed gaps in the MD curriculum on the impacts of climate change, this study illustrated the specific gaps that need to be addressed. MD students need to be aware of the positive impacts of green spaces and ecosystem integrity on the mental health of their patients. Specifically, curriculum should promulgate students to contemplate the impact of environmental factors and atmospheric toxins on health including the impacts of global warming on the occurrence of heatstroke, allergies and vector borne zoonoses.

The question may be asked, why do MD students intending to return to the US to practice need to know about the relevance of OH to practice? Asgary, Price and Ripp (2012) argue that globalisation has led to an increase in global interactions and alterations in disease epidemiology. As a result, Asgary et al. (2012) argue that once isolated infectious diseases are transcending national borders, ethnic groups and cultures. As Asgary et al. (2012) discuss, as the immigrant population to the US has markedly increased, so has the concomitant expectations of the physician to be competent in identifying social, behavioural and cultural factors in order to secure the correct treatment protocols for addressing tropical zoonoses The address of the latter can benefit from a collaborative One Health approach by social, public health, environmental, medical and veterinary professionals providing support for incorporation of One Health content within the MD curriculum.

Specifically, Nordhues, Bashir, Merry and Sawatsky (2017) discuss that medical students must be aware of the social, economic and epidemiological disease determinants that lead to zoonotic diseases such as scabies that are relevant to international health practice. These types of relevant exposures already occur for the MD MPH and DVM MPH students that conveys the greater readiness of these students for collaborative practice in the global environment.

DVM students should receive exposure to more structured OH content that brings in environmental health content that enables them to be aware of their role in mitigating the impacts of wildlife habitat destruction that has implications for both loss of biodiversity as well as zoonoses emergence (Wong et al. 2013). DVM students should have curricula content exposure that promotes their awareness of their role in mitigating the impacts of global warming that has implications for causing heat stroke in animals, melting of the polar environments that contributes to loss of arctic species and an increase in the emergence of vector- borne zoonoses.

Significant efforts are needed to engage the faculty in curriculum mapping to identify where OH content is currently being covered in the MD and DVM programmes. This

information can be used to develop IPE that brings the MD and DVM students into shared classrooms capturing content omitted in the curriculum. The latter can be provided through mandatory shared IPE and OH workshops providing opportunities for discussion of content relevant to the future practice of each discipline.

Whilst many have proposed early delivery of IPE to promote collaborative learning, what is equally essential is to ensure that students are exposed to relevant curriculum content that illustrate the relevance of theory to practice (Lees & Meyer, 2011; Tegzes, 2017). Next, the recommendations arising from this study will discuss the role of Leadership and Organisational culture.

6.1.2. Leadership and Organisational Culture

The findings of this study show that the absence of an accreditation mandate for IPE and OH in the MD program may have led to the subsequent removal of the one lecture the medical students had on One Health by the MPH faculty. The latter is consonant with the perspectives of the MPH faculty within the MD program that perceived this as a blatant lack of administrative recognition of their value within the School of Medicine (SOM).

Lewitt et al. (2018) reiterate the known challenges to developing IPE initiatives lies in leadership types that establish institutional cultures that foster separation across the disciplinary groups. Transformative changes to the style of leadership are crucial for developing institutional environments that facilitate teamworking (Best & Williams, 2019) and foster an appreciation of the importance of interprofessional learning (Lestari, Stalmeijer, Widyandana, & Scherpbier, 2018; Lewitt et al., 2018). Peter Senge (Senge, 1990) proposes that this can be addressed by developing a learning culture for the organization where each individual in the organization perceives their value in initiating positive and relevant change. In the absence of leadership support strengthened by the absence of an accreditation mandate for IPE and OH at the institution, other practical methods should be incorporated that can provide students with OH content. The latter is crucial to adequately enhance their competency for health practice in the global environment.

Most faculty that participated in this study were interested in collaborating and discussing ways in which IPE that includes OH could be developed. The findings of this study show that asset mapping, as discussed by Mor, Robbins, Jarvin, Kaufman, and Lindenmayer (2013), can be used for identifying these types of existing faculty at the institution that already are IPE and OH champions, for promoting IPE and OH implementation. The use of faculty already employed at this institution where this research

was conducted, and within other institutional contexts, are the ones best placed to provide interprofessional leadership role models for driving IPE that includes OH. Uehlinger et al. (2018) argue that it is these faculty that recognize the need for transformative leadership that can remove the factors inhibiting the development of IPE that includes OH.

Promoting student readiness for collaborative practice requires changes in their attitudes and perceptions of the relevance of IPE and OH to their future roles. Faculty across the disciplines should collaborate to develop short electives or virtual learning modules in OH as IPE initiatives for MD and DVM students. Targeting MD and DVM students early on by inviting them to participate in shared IPE platforms that expose them to invited international leaders in OH may promote their perception of the relevance of OH before their professional identity is formed. Next, the recommendations regarding use of the Community of Practice (CoP) model will be discussed.

6.1.3. Community of practice (CoP) Model for this Institution.

The principle of Lave and Wenger's (1991) CoP is based on social learning frameworks. The CoP model can be used to bring the students, academic, and clinical faculty together across the disciplines of medicine, veterinary medicine, and public health to form an IPE community of practice. As members of an institution that offers medical, veterinary and, public health programmes, we are ideally positioned to develop IPE efforts through the development of campus communities of practice.

Sterrett, Hawkins, Hertweck, and Schreiber (2015) discuss that the CoP is a theoretical frame advocated for use in designing and creating IPE (not an aim of this study). Loversidge and Demb (2015) advocate that it is crucial that students see the relevance of the theoretical principles of IPE for practice. This can be achieved by engaging our campus physicians and veterinarians, along with our public health faculty to provide genuine and relevant clinical and research exposure to our students.

As an insider researcher that has already developed a professional relationship with the key IPE and OH faculty that participated in this study, I can seek to recruit the faculty that participated in this research, into CoP groups. Lee, O'Connor, Valiga and McNeill (2019) discuss the use of the social capital theoretical framework which can be used to foster CoP's. The SCT framework draws on a structural frame (campus meetings with CoP members), a cognitive frame (discussions to develop shared goals for developing IPE and OH scholarship) and relational frameworks (transformative leadership styles) for building trust that can be used for developing campus CoP's across our programs. I can now draw on this

model to foster the development of these CoP's. These faculty CoP's can involve students in IPE and OH events that invite guest speakers in these areas to hold workshops that promote an understanding of the roles of other groups for widening the campus CoP.

Importantly, Best and Williams (2019) discuss that the development of CoP's can assist the maturation of the student's professional identity through trust building and ultimately facilitating a positive attitude towards shared learning and collaborative practice. Similarly, Goldie (2012) discuss that the development of professional identities and concomitant dissolution of power constructs can occur through membership in Interprofessional CoP's that foster meaningful interactions for students that include exposure to communication courses, patient exposure and good IPE and OH faculty role models that promote the importance of collaborative practice. I can begin to foster student inclusion by inviting students that already perceive the benefits of IPE that includes OH such as the dual degree students and those with prior public health experience. It may be that if they have positive experiences within these CoP's that enable them to see its benefits to their learning, they may encourage students without a prior awareness of the importance of IPE and OH to become involved. Through these CoP's, health professions students will become familiar with the interprofessional culture which may promote the development of a professional identity that is more embracing of other groups as proposed by Sterrett et al. (2015).

6.1.4. Vision.

The focus group and interview discussion in this study led to my creation of a proposed vision for the institution that supports the philosophy of OH. It is recommended that the institution consider this vision for operationalizing its claim to supporting the OH philosophy: *Health will be perceived as the embodiment of a shared experience involving the preservation of animal, human, and environmental health for optimizing the health of all species and the environment they live in. Thus, it is the vision of this institution that medical and veterinary education will support and advance global health in its educational, research, and social activities within the framework and realization of the One Health concept. Shared interprofessional learning opportunities across the disciplines will promote the development of graduates that will transform healthcare through a collaborative approach to practice.* This vision can be used to provide an expectation to future student recruits across the disciplines about the type of medical education they will be receiving.

6.2. Step 13: Reformulation of the Research question. Future Research

A natural progression of this work would be to implement actionable research to implement an IPE intervention that includes the principles of OH in a similar process to that conducted by Van Dongen et al. (2018). A further study could involve the same faculty and administrators that participated in this study along with volunteer veterinary, dual degree, and medical students for designing this type of IPE intervention. The working group would be involved in identifying the most appropriate student recruits for piloting the intervention and who are willing to complete a pre-pilot survey to ascertain their readiness for IPE. Additional questions asking them to define OH would be incorporated to determine their pre -course knowledge on OH. These students would then be required to retake the survey after piloting the intervention to compare the outcomes to their pre-course feedback. Interviews would also be conducted on faculty and students' groups involved in the pilot for conducting a Strengths, Weakness, Opportunities, and Threats (SWOT) analysis, as discussed by Bennett et al. (2011). The results of this research could be used to provide support for obtaining administrative support for future IPE development.

Further research that provides evidence that IPE does improve patient care may promote changes to accreditation policies for IPE (Illingworth & Chelvanayagam, 2017). The latter is essential towards promoting administrative support for developing and implementing IPE that includes OH.

This study also lays the groundwork for future research that could assess the readiness of medical and veterinary students during their clinical rotations for collaborative practice that would include an assessment of their business and communication skills. This will allow a comparative assessment to be conducted to determine whether clinical exposure enhances student attitudes to interprofessional learning and practice.

6.3. Limitations

Some limitations of this study were discussed in Chapter 3. The study was limited by the use of a purposive sample of students, which limits the generalizability of these findings to the broader student population at the institution and other contexts. Unfortunately, the study did not include interviews or focus groups with these students. The latter, particularly if it permitted student recruitment across the disciplines, may have provided insight into the views of the various groups on IPE that includes OH. However, interviews and focus groups

sessions with students were not allowed by the interviewee of the Medical school due to ethical concerns regarding the preservation of their anonymity. An additional limitation was that it was not possible to clarify the student responses on OH as students were required to complete the open-ended responses on the concept anonymously. The latter may have led to some researcher bias in my interpretation that was declared in Chapter 3. The latter was addressed by my remaining mindful of this in the inferences made and through providing quotations of their written statements defining the concept. This study was further limited by the small sample size of the DVM MPH population and the legitimacy of making conclusions from their feedback. However, this was not a fault of the research, as only 22 students are enrolled in this program.

Several authors discuss their selection of the Readiness for Interprofessional Learning Scale (RIPLS) to determine student readiness for IPE based on it being the most frequently used, validated instrument in the international literature and hence the most widely understood (Oishi et al., 2017). De Oliveira, et al., (2018) in Brazil; Lestari et al.,(2016) and Tyastuti et al. (2014) in Indonesia; Maharajan et al., (2017) in Malaysia; Pype and Deveugle (2016) in Belgium and Ong et al. (2017) in Singapore; Talwalkar et al., (2016) in the US; and Vafadar et al. (2015) in Iran are among many others that have used the tool to determine the readiness of students across the health disciplines for IPE.

Mahler et al. (2015) dispute the RIPLS can be used to measure readiness which, they assume to be akin to attitudes to IPE when students are not cognizant of the attitudes they are required to develop for IPE. The authors Mahler et al. (2015) suggest the lack of a robust theoretical framework deters from the instrument's validity in what it purports to measure (Mahler et al., 2015). There are certain limitations to the use of the RIPLS ,particularly regarding its roles and responsibilities domain as earlier described by King et al. (2012) and Mahler et al.'s (2015). Specifically, Dickson and Krumwiede (2019), Mahler, Rochon, Karstens, Szecsenyi, and Hermann (2014), Mahler et al. (2015) argue the RIPLS is not an appropriate tool for measuring changes in readiness to IPE pre and post IPE interventions. Mahler et al.'s (2015) observation that the instrument may not be useful for detecting alterations in student readiness for IPE and that it lacks psychometric robustness is accepted.

Dickson and Krumwiede (2019) argue that Item Response Theory (IRT) is a more suitable evaluation tool of the robustness of the RIPLS than classical test theory (CTT), which is conventionally used to assess validity. The IRT they argue is superior as it evaluates

the validity of individual items as opposed to the overall test and is not affected by small sample sizes.

Despite issues raised about the psychometric capacity of the instrument soon after its development, Havyer et al. (2016) reported the instrument as one of the most appropriate for evaluating student readiness for IPE based on evidence-based support for the use of the RIPLS. Additionally, despite concerns raised about the instrument by Mahler et al. (2015), many published authors, as earlier reported, have continued to use the instrument to determine student readiness for IPE.

Limitations of the RIPLS tool are accepted as is the fact that there are no tools that entirely assess student readiness for interprofessional learning (Schmitz & Cullen, 2015). The support for the use of the instrument has been its ability to detect the readiness of undergraduate students across the health professions for IPE with the literature providing past and present evidence-based support for its use in achieving this objective (De Oliveira et al., 2018; Yu et al. 2018). The extensive use of the instrument has enabled valuable insights to be obtained into the challenges to developing IPE, as reported by Oishi et al. (2017), De Oliveira et al. (2018), and Milutinović, Lovrić, and Simin, (2018); amongst others. Measures of reliability using Cronbach alpha and validity assessments using factoral analysis enabled a comparative assessment of the ability of the instrument to measure what it sought to do across these studies. Similarly, Schmitz and Brandt (2015) agree with the lack of robustness of the RIPLS but suggest as does Kerry, Wang and Bai (2018) that there are no tools available that are without validity issues.

Parsell and Bligh (1999) explain that their research was an exploratory one to assess student readiness for IPE based on expert determined IPE outcomes such as attitudes facilitating teamwork, communication, and an appreciation of the role responsibilities of other groups. Similarly, this current study does not seek to determine changes in readiness for IPE nor to validate the RIPLS instrument.

There is no evidence-based research support for IRT as there is for the conventional evaluation of RIPLS across the literature using CTT. Additionally, this study did not seek to assess the scores of individuals as IRT would enable (Hwang, 2002) but rather to obtain a cross-sectional snapshot of the readiness of student groups across the health professions to inform IPE development for which the classical evaluation of RIPLS was adequate. While Kerry et al. (2018) and also utilizes IRT to assess the tool and agree that the RIPLS has

psychometric issues, they recommend against its disuse given the evidence-based literature providing support for it.

The RIPLS tool was adequate in achieving its objective as discussed below. Students that undertook the pilot in this current research reported the RIPLS statements were clear, suggesting that the sample population of MPH students and those in advanced stages of the MD and DVM programs were aware of the expectations of shared learning. Concerns regarding the roles domain within the RIPLS were addressed in this study by individually analysing the items 17-19 pertaining to the roles subscale. Importantly, the current study utilized the same methods discussed by multiple authors for establishing the reliability (Cronbach alpha) and validity (factoral analysis) of the RIPLS (McFadyen et al., 2005). Exploratory factor analysis of the RIPLS in the current study provided insight into the state of readiness for students at this institution, adding to the small evidence base on the readiness of DVM students and the complete lack of evidence for dual degree student readiness for IPE. The findings obtained also guide further developing IPE tailored to the identified needs of the institutional context where this research was conducted.

Schmitz and Brandt (2015) recommend continued use of the RIPLS to understand better the types of validity issues that can be encountered in using various instruments to assess student readiness for IPE. Schmitz and Brandt (2015) explain that the validity issues posed by RIPLS are correct of all tools, particularly if used as frequently as the RIPLS is for assessing student readiness for IPE. The latter issues include the diversity of populations sampled (students from veterinary medicine, medicine, and others), how the instrument is administered, and the timing of its use in the health professions programs. Schmitz and Brandt (2015) argue that regardless of the instrument used to assess student readiness for IPE, the scales used to measure readiness for IPE such as team work, identity, and roles, are in themselves highly correlated, creating a challenge to identifying an instrument that can delineate these domains. There are limitations of the RIPLS as will all tools currently in use to assess student readiness for IPE, but the tool was found to be applicable to the context of this study.

6.4. Contributions to Knowledge

Notwithstanding these limitations, this is the first study, to my knowledge, that assesses an extensive cross-section of DVM MPH and MD MPH and MD and DVM students with multiple ethnicities and nationalities on their readiness for interprofessional learning. The fact that ethnicity does not have an impact on readiness for IPE is consistent with the findings of other studies such as Rajiah et al. (2016) and serves to dispute the assumption that ethnic diversity may impede collaboration. To my knowledge, it is also the first study to obtain, assess, and compare the opinions of MPH, DVM, and MD faculty about the development of IPE that includes OH.

Although other studies have identified gaps pertaining to IPE and OH in the curricula of the MD and DVM programmes, this focused study provides further insight into the specific nature of these gaps that has implications for informing the curriculum of these programmes. These gaps were as earlier stated: the impacts of global warming on human and animal health; the effects of foodborne diseases of animal origin on human health; the impact of socio-cultural and environmental factors on the occurrence of zoonoses with implications for human and animal health; the role of the human-animal bond on human mental health and the implications of antimicrobial resistance for public health.

This research has provided a significant and original contribution to the literature on IPE and OH by illustrating how IPE that includes OH can be successfully implemented through the inclusion of the dual degree MPH students in this study. The scores and responses of these students provided insight into the benefits of IPE and OH as it occurs through the MPH for promulgating future graduates to engage in a collaborative approach to practice.

This study also provides novel theoretical insight through the lenses of social identity theory and role theory for understanding the comparative differences in student's readiness for IPE across the disciplines. The insight gained here extends that of the Theory of Planned Behaviour (TPB), illustrating that the socialization process of the comparative disciplines impacts the student's intention to engage in IPE. Importantly, the Theory-Based Stakeholder Evaluation (TSE) model provides a framework for future evaluations of faculty and administrator perspectives for assessing the challenges and opportunities for developing IPE that includes OH. Early exposure to IPE that includes OH may aid in socializing students into a culture that promotes an interprofessional identity before their professional identity is formed, locking them into the traditional siloes of their disciplines.

The inclusion of the DVM group alongside the MD group in this research, extends the findings of other studies that conventionally include allied human health professions students alongside the MD student groups in assessing student readiness for IPE. It was surprising to find that quite a few MD students at the institution did recognize the importance of the MD-DVM collaboration as key to OH, although the MDs were the least open to IPE. The latter suggests that there is some recognition of more equal status between the MDs and DVMS compared to the groups the MDs are traditionally aligned within the IPE literature. However, the higher readiness scores of the DVM compared to the MD students suggests that through their awareness of their role in protecting the public health, the DVM students expect to participate in collaborative practice. This provides more evidence-based support for the role of public health components in the curriculum of the MD program for fostering an appreciation of the roles of other groups and the value of interprofessional learning and practice.

The research conducted in this study has already provoked some institutional change in the direction of beginning to build support for developing IPE that includes OH within the curriculum of the MD and DVM programs. The RIPLS scores obtained across the health professions programs and the student responses about One Health, enabled an evaluation by key faculty relevant to IPE development for gauging the readiness of our students for IPE that includes OH. The research also enabled faculty to perceive the gaps in the understanding of students across the various professions about the relevance of OH and by extension collaboration and shared learning to their future practice.

Oura (2014) argues that while it is easy to write about the advantages of collaborative practice, beginning the dialogue between various stakeholders is the greatest challenge. In bringing together our public health, medical and veterinary faculty in this study, we have begun this dialogue. Already the latter has led to plans and discussions about how research collaborations can occur interdepartmentally as well as involving joint collaborations between clinicians and students across the MD and DVM programs. Individuals across programs are aware of colleagues that share an interest in collaboration and One Health and where OH is occurring across various programs that can fuel further networking and potentially the evolution of IPE/OH communities of practice.

Future IPE interventions that include OH content should consider how the relevance of the concept is conveyed. Many students perceived the health of animals and the environment as significant only if they impacted human health. The latter reveals an ethical

issue that indicates a need to incorporate an understanding of OH that places importance on the health of animals and the environment independently of their effect on human health.

The key influencers for IPE that include OH appear to be the institutional culture and leadership, shared campus location for health programs, prior public health experience, gender, accreditation requirements, and program of enrolment. It is anticipated that this research will provide original contributions to the wider practitioner educator community on the use of various theoretical lenses to determine student readiness for IPE and for developing IPE that includes OH. The findings of this study provide evidence that conducting an MPH provides medical and veterinary students with greater readiness for IPE and collaborative practice and may close the gaps that currently exist in the curricula of both medical and veterinary education. Promoting the principles of One Health within the framework of IPE provides an opportunity to drive this change within each unique practitioner-based context.

6.5. Closing

It is not the recommendation of this study to change the role definition for the future physician and veterinarian nor to increase the curriculum workload. Rather the findings of this study through the faculty and administrator dialogues that occurred across the programs, demonstrate that it is in understanding the roles of each discipline that a more comprehensive approach can be achieved for optimising patient care. As an example, the physician that encounters a case of Lyme disease in a human patient can liase with a veterinarian to discuss the care of the pet that may be harbouring the vectors responsible for disease occurrence limiting future exposures. The future veterinarian and physician can benefit by simply engaging in dialogue with one another towards handling cases that impact the health of both humans and their animals.

The essence of IPE is to promote the development of the much-needed skills required for collaborative practice. Developing IPE as a tool for delivering the principles of OH is more than providing content. The development of communication and teamworking skills and an appreciation of the roles and responsibilities of other professional groups is critical for executing collaborative practice as embodied by OH. However, radical changes to the accreditation criteria of the medical disciplines are unlikely to change soon. To overcome, this possible change can be made using the University's existing faculty resources to provide MD and DVM students with OH content independent of IPE. This is crucial for preparing the

next generation of medical and veterinary graduates for engaging in collaborative practice for optimizing the animal, human, and planetary health in the global environment.

6.6. Personal and Professional Development emerging from the Professional Doctorate

Wellington, Bathmaker, Hunt, McCulloch, and Sikes (2005) suggest that the archetypal individual that elects to enrol in a professional doctorate is one who seeks to develop their skills in utilizing practical applications for improving their professional practice. The development and engagement in practitioner research have led to my professional transformation, providing a toolset for approaching institutional challenges as a practitioner educator. The engagement in the research stage of the study has enabled confidence development for applying various research methods for tackling diverse institutional issues. The latter has led to my appreciation of the significant benefits of coupling qualitative methods with quantitative designs for obtaining a comprehensive perspective of institutional problems that are crucial for implementing change. Specifically, my skills in reviewing and critically evaluating the literature surrounding IPE and OH, has given me more credibility with my colleagues as a public health educator, for engaging them in discussions surrounding the development of IPE initiatives that include OH.

I have learned through my engagement in this research, the social importance of the relationships that have been developed with colleagues over the years, that has enabled me to obtain greater participation than would have otherwise been possible. Undertaking this research has led me to consider the "guilty knowledge" (Williams, 2009) that comes with the dual role of being an educator and an insider researcher. I have obtained the frank perspectives of my colleagues that have participated in this research about the institutional challenges they face. The engagement in this research has enabled my awareness of the different ethical considerations that occur when reviewers evaluate qualitative research, specifically, the lack of attention paid to protection of the human participants as discussed by King, Bivens, Pumroy, Rauch, and Koerber, (2018). The latter has promulgated in me a sense of moral and professional responsibility for preserving the confidentiality of my participating colleagues to avoid risks to their employment status within the organisation.

Fenge (2010) discusses the challenges of merging the practitioner role with that of the researcher and developing critically reflective skills to enable this transformation. To become submerged in the research led to my development of sharpened reflective skills in critically evaluating the literature culminating in the selection and application of various

theoretical lenses for explaining the research findings. Lundgren-Resenterra and Kahn, (2019) discuss Archer's (2003) four types of reflexivity. In consideration of the latter, conducting this research has promulgated me to engage in metacognitive reflexivity. This type of reflexivity has led me to consider how my personal values align or differ with organizational values with implications for informing change. Throughout the development of this thesis, engaging in the practice or reflection has enabled me to remain mindful of my biases as an educator and how that influences my assumptions about institutional issues and also the inferences that have emerged from this study.

In conducting the focus group component of the research, I have learned the benefits of "collective reflexivity" (Lundgren-Resenterra & Kahn, 2019, p. 407). Undertaking this research has assisted me in developing confidence for engaging my work colleagues in critically reflecting upon the need for IPE and OH within the institution with the goal of driving specific organisational change. I have learned how the roles of various faculty and administrators can differentially impact change and also how the characteristics of its leadership can either promote or inhibit institutional change.

The pursuit of this research has enabled my personal growth as an individual now armed with confidence and self-awareness for engaging my colleagues in discussions for critically evaluating institutional issues with the goal of driving relevant changes. Undertaking the research has also enabled my understanding of my organisation and promulgated my professional growth as an educator armed with the tools for evaluating professional practice directed at driving contextually driven institutional change.

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APPENDIX A: University of Liverpool Ethics Approval Certificate

UNIVERSITY OF LIVERPOOL | ONLINE PROGRAMMES

Dear Rohini Roopnarine

I am pleased to inform you that the EdD. Virtual Programme Research Ethics Committee (VPREC) has approved your application for ethical approval for your study. Details and conditions of the approval can be found below.

Sub-Committee:	EdD. Virtual Programme Research Ethics Committee (VPREC)
Review type:	Expedited
PI:	
School:	School of Histories, Languages and Cultures
Title:	Readiness of Medical and Veterinary Students for Interprofessional Education
First Reviewer:	Dr. Marco Ferreira
Second Reviewer:	Dr. Mary-Johnson
Other members of the Committee	Dr. Lucilla Crosta, José Reis-Jorge, Arwen Raddon, Mariya Yukhymenko.
Date of Approval:	25th September 2018

The application was APPROVED subject to the following conditions:

Conditions		
1	Mandatory	M: All serious adverse events must be reported to the VPREC within 24 hours of their occurrence, via the EdD Study Primary Supervisor.

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to make an amendment to the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc.
Where your research includes elements that are not conducted in the UK, approval to proceed is further conditional upon a thorough risk assessment of the site and local permission to carry out the research, including, where such a body exists, local research ethics committee approval. No documentation of local permission is required (a) if the researcher will simply be asking organisations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants. When medical, educational, or business records are analysed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform his or her job).

Please note that the approval to proceed depends also on research proposal approval.

Kind regards,
Lucilla Crosta
Chair, EdD. VPREC

APPENDIX B: University IRB Approval

[redacted]

Institutional Review Board

7th September 2018

Rohini Roopnarine
School of Veterinary Medicine
St. George's University

Re: Approval of SGU IRB Application* 18051-*" Evaluating the Readiness of Medical and Veterinary students for Inter-Professional Education (IPE) and Faculty perceptions on implementing IPE at a private medical school in the Caribbean"

Dear Dr. Roopnarine,

Your application for approval, for the use of human participants in the captioned research project has been reviewed by the [redacted] Institutional Review Board (SGU IRB). This letter serves to advise that your revised application is hereby approved.

If there are no obstacles and no changes to the research protocol as approved, kindly note that we shall require a progress report twelve months following the date of approval. An annual summary report is due no later than **Friday, 15th March, 2019**. The form is also posted on the IRB page of the [redacted]y's website. Please submit it to the IRB Administrator, Kareem Coomansingh, email kcoomans@sgu.edu, telephone 473 444-4175 x 3221 and fax 473 444-4388. An e-version is preferred.

In the event that any change(s) is anticipated, as the Principal Investigator, you must notify the IRB to seek permission to make such change(s) before you can proceed. Should you have any questions regarding this approval, please contact the IRB Administrator. If an adverse event arises you are required to notify the IRB administrator immediately and discontinue the research until the situation has been assessed.

Outcomes of research must be provided to the IRB/SGU Office of Research. Any publications or conference presentations arising from the research should be shared with the Office of Research. All conference presentations and publications are listed in the SGU Annual Report. A comprehensive list of past completed research projects can also be found in this report.

Sincerely,

Maira du Plessis
Chair, IRB
Instructor, Department of Anatomical Sciences

S
Telepho[redacted]

APPENDIX C: Readiness for Interprofessional Learning Scale Survey

Please indicate the following:

Demographics

Age Ranges: 18–24 ☐

25–34 ☐

> 35 ☐

Gender:

Ethnicity:

Black or African American ☐

Asian ☐

Native American ☐

Hispanic or Latino ☐

White ☐

Other ☐

Nationality:

US ☐

Canadian ☐

British ☐

European ☐

Asian ☐

Caribbean ☐

African ☐

Other ☐

Professional program:

MD ☐ MD/MPH ☐ DVM ☐ DVM /MPH ☐

Program Term:

Prior Public Health Education/exposure: (MPH, participation in One Health clinics, other). Please describe in the space below, if any**:**

Are you familiar with the term "One Health"?

Yes ☐ No ☐

If 'Yes', please answer the following questions:

1. Define the concept of One Health in the space below:

2. What is the relevance of the One Health concept to your practice as a global health professional? Please describe:

Please indicate the degree to which you agree or disagree with the statement by circling (**paper version survey**) the number of the response that best expresses your feeling.

The scale utilised: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.

1.	Learning with other students will help me become a more effective member of a health care team	1	2	3	4	5
2.	Patients would ultimately benefit if health care students worked together to solve patient problems	1	2	3	4	5
3.	Shared learning with other health care students will increase my ability to understand clinical problems	1	2	3	4	5
4.	Learning with health care students before qualification would improve relationships after qualification	1	2	3	4	5
5.	Communication skills should be learned with other health care students Good	1	2	3	4	5
6.	Shared learning will help me to think positively about other professionals	1	2	3	4	5
7.	For small group learning to work, students need to trust and respect each other	1	2	3	4	5
8.	Team-working skills are essential for all health care students to learn	1	2	3	4	5
9.	Shared learning will help me to understand my own limitations	1	2	3	4	5

10.	I don't want to waste my time learning with other health care students	1	2	3	4	5
11.	It is not necessary for undergraduate health care students to learn together	1	2	3	4	5
12.	Clinical problem-solving skills can only be learned with students from my own department	1	2	3	4	5
13.	Shared learning with other health care students will help me to communicate better with patients and other professionals	1	2	3	4	5
14.	I would welcome the opportunity to work on small-group projects with other health care students	1	2	3	4	5
15.	Shared learning will help to clarify the nature of patient problems	1	2	3	4	5
16.	Shared learning before qualification will help me become a better team worker	1	2	3	4	5
17.	The function of nurses and therapists is mainly to provide support for doctors	1	2	3	4	5
18.	I'm not sure what my professional role will be	1	2	3	4	5
19.	I have to acquire much more knowledge and skills than other health care students	1	2	3	4	5

Sub-scales are:

SS1: Teamwork 7 Co-operation – Items 1–9

SS2: Negative Professional Identity – Items 10–12 [reverse scored]

SS3: Positive Professional Identity – Items 13–16

SS4: Roles & Responsibilities – Items 17–19 [reverse scored*]

*Note: items were reverse-scored to calculate the overall mean score, i.e., strongly disagree = 5, disagree = 4, neutral = 3, agree = 2 and strongly agree = 1. (Maharajan et al., 2017); Max/Min Scores are: 45/9; 15/3; 20/4; 15/3, respectively.

APPENDIX D: Focus Group and Interview Questions

Introductory questions	Key Questions	Follow up questions	Final Question
What is your role at the University? What do you perceive as the global relevance of IPE?	Based on the student Readiness for Interprofessional Learning Scale (RIPLS) survey scores what are the factors you perceive that influence student readiness or differences in readiness for Interprofessional learning?		Would you be interested in becoming involved in designing IPE? If we were required to developing IPE to maintain our accreditation status, what would our vision statement for the institution look like as it pertains to promoting the institutional realization of its support for One Health?
	Do you feel there is a need for Interprofessional Education (IPE) and One Health Education in the core medical and veterinary curricula or is enough being done at SGU to prepare our MD and DVM students for a collaborative approach to health practice in the global environment?	Does IPE exist at SGU? What impact would you like it to have on our medical and veterinary graduates?	
	What do you feel are the key opportunities to developing IPE within the core MD and DVM curricula at the University?		
	What do you feel are the key challenges to developing IPE within the core MD and DVM curricula at the University?	How can any challenges be overcome?	
	Do you think the University is doing enough institutionally that aligns its programs with its declared support for the One Health-One Medicine philosophy?		

APPENDIX E: Cumulative Percentage of Variance and Eigenvalue >1 Rule

	Initial Eigenvalues			Extraction of Squared Loadings			Rotation of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.509	50.048	50.048	9.509	50.048	50.048	6.931	36.479	36.479
2	1.876	9.872	59.920	1.876	9.872	59.920	4.283	22.542	59.021
3	1.383	7.277	67.197	1.383	7.277	67.197	1.554	8.176	67.197
4	.991	5.217	72.414						
5	.825	4.344	76.758						
6	.669	3.519	80.277						
7	.616	3.244	83.521						
8	.412	2.166	85.687						
9	.373	1.964	87.652						
13	.344	1.810	89.461						
14	.297	1.561	91.022						
15	.277	1.461	92.482						
16	.270	1.422	93.905						
10	.236	1.240	95.144						
11	.221	1.164	96.308						
12	.201	1.059	97.368						
17	.182	.959	98.327						
18	.164	.861	99.187						
19	.154	.813	100.000						

Extraction Method: Principal Component Analysis.

APPENDIX F: Scree Plot