The Influence of an Educational Intervention in Developing the Interprofessional Values and Behaviors of Doctor of Physical Therapy Students

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The Influence of an Educational Intervention in Developing the Interprofessional Values and Behaviors of Doctor of Physical Therapy Students

Abstract
Interprofessional collaboration is a key component of the provision of high quality, safe, and effective healthcare. The complex needs of patients demand that healthcare professionals demonstrate competency within their particular discipline, and in interprofessional collaboration. The programs that educate healthcare professionals, including physical therapy programs, are obliged to provide students interprofessional education (IPE) to meet accreditation guidelines and to prepare students for professional practice. The literature lacks evidence on the ability of IPE to impact higher level learning outcomes, such as students’ interprofessional behaviors. The purpose of this study was to understand the influence of an IPE experience on Doctor of Physical Therapy students’ interprofessional values and behaviors. In addition, the interprofessional values and behaviors of all students who participated in IPE were compared to one another. Findings from this quantitative quasi-experimental study indicate that the IPE experience improved the self-assessed interprofessional behaviors of the physical therapy students who participated, as compared to peers who did not. Additionally, among the students who participated in IPE, the most novice students retrospectively identified significantly lower pretest levels of interprofessional behaviors, as compared to students who were approaching the end of their program. However, despite these initial differences, students of all disciplines experienced a similar amount of growth in their self-reported interprofessional values and interactions at the conclusion of the IPE experience. In this study, IPE based on interprofessional competency frameworks, with learning objectives aligned to instructional methods produced higher level learning outcomes, including changes in self-perceived interprofessional interactions and behaviors.

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The Influence of an Educational Intervention in Developing the Interprofessional Values and Behaviors of Doctor of Physical Therapy Students

By

Jennifer C. Fay

Submitted in partial fulfillment
of the requirements for the degree
Ed.D. in Executive Leadership

Supervised by
Dr. Joshua Fegley

Committee Member
Dr. Kathleen Dever

Ralph C. Wilson, Jr. School of Education
St. John Fisher College

August 2020
Dedication

I am fortunate to live in a time and place that affords me the opportunity to engage in scholarly endeavors while living out the roles of educator, wife, and mother. My success in this work has been due to the love and support of the important people in my life. This dissertation is dedicated to my children, Sean, Rachel, and Ryan, who are the center of my world and the joy of my life. I am certain that over the past 28 months, it was inconvenient to have a mother who spent countless hours researching, studying, and writing. Thank you for the adjustments you made, the patience you demonstrated, and the loving grace you granted as our family created a new normal. I hope this serves as a reminder that hard work, dedication, and persistence allow us to transform our aspirations into reality. Remember this as you pursue your hopes and dreams!

My parents, Daniel and Jane Cuozzo, first taught me about the meaning of education, the importance of work ethic, and the treasure of a family’s love. I am so grateful that they instilled these important values within me, as they were foundational to this dissertation journey. I am blessed with the love, counsel and encouragement that my parents have provided throughout my life.

I would like to express my heartfelt gratitude to my dissertation committee, Dr. Joshua Fegley and Dr. Kathleen Dever. Their support and feedback, which was consistently imparted with care and kindness, have fostered my growth as an educator, scholar and leader. I am fortunate to have accomplished this journey under their guidance.
I am also grateful to have completed the DEXL experience with a cohort of terrific classmates and an exceptional team, Team Heroic. Our education has been punctuated by the good times and special moments we shared as we persevered through the ups and downs of this program. Specifically, I would like to extend my appreciation to Matthew Frahm and Jennifer Sinsebox. Their friendships are a gift of DEXL that I value beyond measure. I am better for having both of these dear friends in my life.

I owe a note of thanks to my colleagues who have been supportive of my scholarly pursuits. I would like to acknowledge Cathy Rasmussen, Melissa Johnson, and Sue O’Brien for their endorsement of my interest in interprofessional research at our institution. Mary Ellen Vore, furnished me with a bounty of encouragement and the precious gift of time throughout this process, for which I am very thankful. Finally, I am grateful to J.J. Mowder-Tinney for her mentorship and friendship over the past two decades. I hope to be a leader who nurtures the potential in others, as she has within me.

Most importantly, I would like to thank my husband, Michael. There is no better partner to have in life, and there are not words that adequately express my love and gratitude for him. During this leg of our journey together, he shouldered a heavier load on the home front in order to create the space necessary for me to successfully complete a Doctoral degree. He took on these tasks with pleasure and pride, championing my efforts every step of the way. He provided steady moral support and tended to us with care. His daily actions are demonstrations and reminders of the unconditional love upon which our family is built.
Biographical Sketch

Jennifer Fay is a licensed physical therapist and currently serves as a Clinical Assistant Professor and Clinic Director in the Department of Physical Therapy at Nazareth College. Prior to joining the Nazareth faculty, she engaged in clinical practice in Rochester, NY in the acute care, pediatric, and neurological rehabilitation settings. Ms. Fay completed her undergraduate studies at Ithaca College, earning a Bachelor of Science in Clinical Science. Remaining at Ithaca College for her graduate work, she graduated cum laude with a Master of Science in Physical Therapy. In the summer of 2018, Ms. Fay began the Doctor of Education program in Executive Leadership at St. John Fisher College. She pursued her research on the interprofessional values and behaviors of Doctor of Physical Therapy students under the guidance of Dr. Joshua Fegley and Dr. Kathleen Dever, and received the Ed. D in 2020.
Abstract

Interprofessional collaboration is a key component of the provision of high quality, safe, and effective healthcare. The complex needs of patients demand that healthcare professionals demonstrate competency within their particular discipline, and in interprofessional collaboration. The programs that educate healthcare professionals, including physical therapy programs, are obliged to provide students interprofessional education (IPE) to meet accreditation guidelines and to prepare students for professional practice. The literature lacks evidence on the ability of IPE to impact higher level learning outcomes, such as students’ interprofessional behaviors. The purpose of this study was to understand the influence of an IPE experience on Doctor of Physical Therapy students’ interprofessional values and behaviors. In addition, the interprofessional values and behaviors of all students who participated in IPE were compared to one another. Findings from this quantitative quasi-experimental study indicate that the IPE experience improved the self-assessed interprofessional behaviors of the physical therapy students who participated, as compared to peers who did not. Additionally, among the students who participated in IPE, the most novice students retrospectively identified significantly lower pretest levels of interprofessional behaviors, as compared to students who were approaching the end of their program. However, despite these initial differences, students of all disciplines experienced a similar amount of growth in their self-reported interprofessional values and interactions at the conclusion of the IPE experience. In this study, IPE based on interprofessional competency
frameworks, with learning objectives aligned to instructional methods produced higher level learning outcomes, including changes in self-perceived interprofessional interactions and behaviors.
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**Chapter 1: Introduction**

**Introduction**

A strong, flexible, and collaborative health workforce is necessary to manage complex health problems, including community health, an aging population, and disease epidemics (World Health Organization [WHO], 2010). In order to optimally provide for patients, well-trained professionals must be armed with best practices, operate under strong policies, and be guided by effective leaders (Shekelle et al., 2013). In addition, they must use their knowledge and skills to work collaboratively across disciplines, in order to continuously improve healthcare (Headrick et al., 1996; Institute of Medicine [IOM], 2015; Interprofessional Education Collaborative [IPEC], 2011; WHO, 2010). The World Health Organization (WHO) (2010) indicates that interprofessional collaborative health practice is a key strategic component to mobilize fragmented health systems to a position of strength. Interprofessional collaborative practice occurs when “multiple health workers from different professional backgrounds provide comprehensive services to patients, their families and communities to deliver the highest quality of care across settings” (WHO, 2010, p. 13). Interprofessional healthcare teams utilize the knowledge and skills of members in order to better serve patients, strengthen health systems, and improve outcomes (WHO, 2010).

The education of healthcare providers has evolved more slowly than the healthcare system, resulting in a gap between the skills taught and those needed to effectively provide care in complex clinical and social environments (Frenk et al., 2010).
Historically, the professional preparation of healthcare professions has not included opportunities for different types of students to learn how to work together, but has focused on the provision of knowledge and skills specific to a particular field (D’Amour & Oandasan, 2005; Hammick, 1998; Headrick et al., 1996). However, in addition to their specific professional competencies, today’s healthcare environment demands that providers understand how to form and use teams to provide customized patient care across settings over time (Baker & Durham, 2013; IOM, 2001). In order to collaborate effectively to improve health outcomes, practitioners from different professions must have the opportunity to “learn, about, from, and with each other” (Centre for the Advancement of Interprofessional Education [CAIPE], 1997, p. 19). This instruction is termed interprofessional education (IPE) (WHO, 2010). Interprofessional educational experiences allow students to develop the attitudes, knowledge, behaviors, and skills required for collaboration with other professionals (Bainbridge, Nasmith, Orchard, & Wood, 2010). This chapter will discuss the changes in the health care system that have occurred over the past 25 years that demand the integration of interprofessional education into the curricula of healthcare professions. It will discuss a theoretical framework underpinning the provision of interprofessional education, identify a problem in this area, and discuss research questions.

A Changing Health Care System

In the late 1990s and early 2000s, the Institute of Medicine (IOM) published landmark reports that indicated significant issues with the quality and safety of care offered by the United States health system. The IOM is a division of the National Academies of Sciences, which were established through presidential order, to examine
policies and procedures related to public health. It acts under congressional charter, and advises the federal government and nation on health and medical issues (Seitz, 2019).

The IOM report, *To Err is Human: Building a Safer Health System* (IOM, 1999) highlighted the high prevalence of errors occurring in healthcare, resulting in severe costs to individuals and communities (IOM, 1999). One of the report’s major conclusions was that errors were not the result of individual or group recklessness (IOM, 1999). Instead, errors were most often the result of poor processes, conditions, and systems, which lead to mistakes, or failed to prevent them (IOM, 1999). Healthcare could be improved by creating systems that better enabled clinicians to avoid errors, and processes that guided them to safe choices (IOM, 1999).

In 2001, the Institute of Medicine published a second report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, which examined the overall quality of healthcare. It identified quality problems at all levels of the healthcare system, from the point of patient contact through the level of insurance and regulation (IOM, 2001). The report indicated that the lack of integration among health sectors and within organizations is quite harmful to patients (IOM, 2001). *Crossing the Quality Chasm* offered a strategy for redesigning healthcare in the 21st century. In order to further delineate the concept of quality, six dimensions of quality healthcare were defined, including safety, effectiveness, equity, efficiency, timeliness, and patient centeredness (IOM, 2001). These were priority areas for focused improvement in the healthcare system (IOM, 2001).

The report emphasized that clients, providers and institutions would have to work together to balance conflicts that may arise and to redesign and improve healthcare (IOM, 2001). In order to support this transformation, 10 principles were outlined that should
underlie all decisions regarding patient care and healthcare system processes, and guide the system to a place of better meeting patients’ needs (IOM, 2001). These principles were identified as both new patient expectations for care and the necessary steps to improve the quality of the healthcare system. The principles, which are listed in Table 1.1, were offered in the context of the structure and function of the healthcare system at the time of the report (IOM, 2001). Some aspects of the “new rules” are effectively integrated into today’s healthcare system, while others remain aspirational in nature.

Table 1.1

*Simple Rules for the 21st Century Health Care System*

<table>
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<tr>
<th>Current Approach</th>
<th>New Rule</th>
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<tr>
<td>Care is based primarily on visits.</td>
<td>Care is based on continuous healing relationships.</td>
</tr>
<tr>
<td>Professional autonomy drives variability.</td>
<td>Care is customized according to patient needs and values.</td>
</tr>
<tr>
<td>Professionals control care.</td>
<td>The patient is the source of control.</td>
</tr>
<tr>
<td>Information is a record.</td>
<td>Knowledge is shared and information flows freely.</td>
</tr>
<tr>
<td>Decision-making is based on training and experience.</td>
<td>Decision-making is evidence-based.</td>
</tr>
<tr>
<td>Do no harm is an individual responsibility.</td>
<td>Safety is a system property.</td>
</tr>
<tr>
<td>Secrecy is necessary.</td>
<td>Transparency is necessary.</td>
</tr>
<tr>
<td>The system reacts to needs.</td>
<td>Needs are anticipated.</td>
</tr>
<tr>
<td>Cost reduction is sought.</td>
<td>Waste is continuously decreased.</td>
</tr>
<tr>
<td>Preference is given to professional roles over the system.</td>
<td>Cooperation among clinicians is a priority.</td>
</tr>
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*Note:* Adapted from, “Crossing the Quality Chasm: A New Health System for the 21st Century,” by the Institute of Medicine, 2001, p.67. Copyright 2001 by the National Academies of the Sciences.
The prioritization of teamwork, shared aims, and cooperation within health systems was highlighted as a major principle for patient care and systemic change. Historically, individual professions’ roles had been separated and protected, and disciplines valued their authority at the expense of system function, and the patient (IOM, 2001). The committee called for a focus on communication and cooperation, and the use of each discipline’s expertise and knowledge, to meet patient needs (IOM, 2001). The embrace of this principle in health practice would require a significant shift in providers’ behaviors and would influence their professional education (IOM, 2003a).

Health professionals were identified as central participants in the overhaul of healthcare in the IOM’s 2003 report, *Health Professions Education: A Bridge to Quality* (IOM, 2003a). In order to meet the challenges of health system transformation, it was determined that healthcare providers across all professions must share a common commitment to meeting patients’ needs. This work was based upon the six dimensions of quality and 10 principles of care that were outlined in *Crossing the Quality Chasm* (IOM, 2003a).

Five competencies were identified as central to the education and practice of all health professionals (IOM, 2003a). These included the provision of patient-centered care, application of quality improvement principles, engagement in evidence-based practice, interdisciplinary teamwork and the use of informatics (IOM, 2003a). These competencies, although not exhaustive, were thought to best support the quality dimensions and principles of patient care, and were based upon seminal studies of the Pew Health Professions Commission (IOM, 2003b).
Throughout the 1990s, The Pew Health Professions Commission published multiple reports aimed at changing health profession education and arming students to thrive in practice in an evolving health system (Bellack & O’Neil, 2000). They contended that students of healthcare professions must have the opportunity to develop broad competencies that are necessary for clinical practice in healthcare environments (Bellack & O’Neil, 2000). Interdisciplinary collaboration was emphasized as a highly significant competency for all disciplines and an educational priority. The Commission stressed that interprofessional education was essential to offer students opportunities to learn about the tangible benefits of teamwork, including improved efficiencies, decreased errors, and the impact of joining expertise to collaboratively care for acute and chronically ill patients (Bellack & O’Neil, 2000). It noted that the continued isolated nature of healthcare professions education would create grave disadvantages for future providers, as well as for the healthcare delivery system (Bellack & O’Neil, 2000). The Institute of Medicine concurred with the Pew Commission points and noted that interdisciplinary teamwork was a critical component in the management of complex care, coordination of patient needs, response to technological changes, and care delivery across settings (IOM, 2003a).

In parallel to the efforts of the Pew Commission and Institute of Medicine, the Agency for Healthcare Research and Quality (AHRQ) took the lead at the federal level in the patient safety movement (Baker, Gustafson, Beaubien, & Salas, 2005). It was charged with the identification of error causes, as well as the development and distribution of patient protection strategies (Baker et al., 2005). To support this mission, it commissioned several reports to review evidence-based data on practices with potential
to improve patient safety (Baker et al., 2005). The analysis concluded that if safe and effective care is the priority, professionals must coordinate their activities; the science of team performance and team training could improve medical safety. It was noted that teamwork competencies and instructional strategies exist outside of the healthcare industry that effectively achieve this aim (Baker et al., 2005). The Agency indicated that the healthcare industry should look to other fields that demonstrated expertise in teamwork in high stakes situations, such as the military and aviation fields, and noted the need for development of a medical teamwork theoretical model (Baker et al., 2005).

After years of research and development, in 2006, the AHRQ, in conjunction with the Department of Defense, released the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) Program as a standard in healthcare teamwork training (King et al., 2008). The evidence-based program was created after a review of the wider literature on teamwork training, and of existing medical teamwork programs (King et al., 2008). It contains four core competencies, including leadership, communication, situation monitoring, and mutual support (King et al., 2008). These skills are considered teachable, through the use of specific tools and strategies. When utilized by the team, these skills lead to outcomes, such as shared mental models, adaptability, trust, team performance, and patient safety. The program was initially tested and implemented at military care facilities, and then was rolled out on a national level to civilian facilities (King et al., 2008). It has been implemented in hospitals, nursing units, and ambulatory clinics throughout the United States, through a trainer program model (King et al., 2008).
The establishment of the Triple Aim of Healthcare (Berwick, Nolan, & Whittington, 2008) further linked interprofessional health care teams to improved healthcare services and patient outcomes. The Triple Aim was developed by the Institute for Health improvement, a not-for-profit organization committed to the improvement of the healthcare system through innovation, and the reduction of errors, waste, costs, and delays (Institute for Health Improvement (IHI), 2019a). The organization, founded in 1991, applies the science of improvement to its pursuit of better quality, safety, and value in healthcare (IHI, 2019a). It uses a set of essential questions to identify improvement goals for a target population, select measurement tools and enact small systematic changes to processes within healthcare organization; then it engages in testing these changes by engaging in a plan, do, study, act form of inquiry (IHI, 2019b). This allows change be tested in real time and real settings, to understand if they are making systemic improvements, and then scaled up if they are determined to be effective (IHI, 2019b).

The Triple Aim sets forth the notion that higher quality healthcare, and improved client outcomes will occur as a result of the pursuit of interconnected goals (Berwick et al., 2008). It posits that the approach required to improve the United States healthcare system must simultaneously address the patient experience, population health, and healthcare costs. Organizations and communities that achieve the Triple Aim will result in healthier individuals because improved systems will manage health before there is a need for acute care services. Redesigned care systems will be coordinated and cooperative, so that the burden of illness is reduced. Cost stabilization will decrease the funding pressure on public health systems and allow communities to invest in resources that support the overall well-being of their stakeholders (IHI, 2019c). The outcomes of
the Triple Aim echo ideas contained in the IOM, Pew, and AHRQ reports in that they reflect the concept of healthcare quality, or care that is safely and effectively delivered by healthcare teams, with positive results (Brandt, Lutfiyya, King, & Chioreso, 2014). The domain of the patient experience also emerges in the Triple Aim, with the consideration of patient satisfaction, as well as provider fulfillment while working on interprofessional teams (Brandt et al., 2014). The Triple Aim reinforces the potential significance of IPE and interprofessional practice in healthcare organizations (Brandt et al., 2014).

The World Health Organization (WHO) specified the significance of IPE and its commitment to this process in its 2010 report, Framework for Action on Interprofessional Education and Collaborative Practice. This document reiterated the idea that from a global perspective, graduates of health professions education programs must be equipped to provide team-based care to effectively address complex health and social problems (WHO, 2010). It noted that as the health needs of communities evolve, the competencies of healthcare professionals must develop as well in order to address the priority needs of individuals and populations (WHO, 2010). The curricula utilized in health professions education programs must be dynamic and adaptable to produce well-equipped graduates (WHO, 2010).

**Interprofessional Competency Frameworks**

Despite multiple calls for teamwork and collaboration to improve the safety and quality of patient care, evidence accumulated indicating that a gap existed between practice needs and the preparation of health professionals (Interprofessional Education Collaborative [IPEC] Expert Panel, 2011). Health professions schools would bear the responsibility for developing students’ competence for interprofessional collaborative
practice (IPEC Expert Panel, 2011). Various disciplines, such as nursing, pharmacy, dentistry, and medicine were integrating IPE into their curricula in isolation, but lacked consistency, agreement, coordination, and an evidence base (IPEC Expert Panel, 2011).

Health professions education programs have been challenged to develop curricula that address the skills needed for providers to engage in team-based practice. IPE is a unique addition to health professional education (D’Amour, Ferrada-Videla, San Martin Rodriguez, & Beaulieu, 2005). Traditionally, students in professional education programs are socialized and educated to adopt a discipline-based view of the services they offer, and the clients they treat (D’Amour et al., 2005). Disciplines subscribe to strong theoretical, specialized frameworks in order to develop specific competencies that offer access to professional jurisdictions and scopes of practice (D’Amour et al., 2005). Logically, professions’ specific knowledge and skills have been taught utilizing a uniprofessional education strategy (Oandasan & Reeves, 2005). However, IPE mandates a change to this point of view, requiring a logic of collaboration and a multiprofessional approach (D’Amour et al., 2005; Oandasan & Reeves, 2005).

Working from uniprofessional health frameworks that were previously established, the Canadian Interprofessional Health Collaborative (CIHC) developed the National Interprofessional Competency Framework (NICF) in 2010 after 3 years of work, with funding from Health Canada (CIHC, 2010). The CIHC ultimately established a framework that is relevant for educators, students, practitioners, and regulators in all practice settings and contexts. The framework embraced Roegiers (2007) philosophy that competencies help students to become proficient in managing situations they will encounter in their professional roles. It highlighted that interprofessional collaboration is
a developmental process, which grows over a professional’s career, and changes with experience (CIHC, 2010). Six competency domains were identified, each delineated with a competency statement, specific behavioral descriptors, and rationale (CIHC, 2010).

The six competency statements are:

1. Learners/ practitioners from varying professions communicate with each other in a collaborative, responsive, and responsible manner.

2. Learners/ practitioners seek out, integrate and value, as a partner, the input and engagement of the patient/ client/ family/ community in designing and implementing care/services.

3. Learners/practitioners understand their role and the role of those in other professions, and use this knowledge appropriately to establish and achieve patient/ client/ family, and community goals.

4. Learners/ practitioners understand the principles of teamwork dynamics and group/ team processes to enable effective interprofessional collaboration.

5. Learners/ practitioners understand and can apply leadership principles that support a collaborative practice model.


The CIHC clarified that the first two competency domains, related to interprofessional communication and patient/ family/ community centered care, support the other four domains, in that they will be relevant in all situations and contexts (CIHC,
In addition, the CIHC (2010) indicated that considerations such as encounter complexity, practice context, and quality improvement would influence the manner in which this framework is applied.

In the United States, concurrent efforts at establishing an interprofessional framework were taking place. In 2010, an expert panel of educators from the nursing, medicine, osteopathic medicine, pharmacy, public health and dentistry fields was convened by the Interprofessional Education Collaborative (IPEC) in order to develop core competencies for IPE and interprofessional collaborative practice (IPEC Expert Panel, 2011). The goal of the competencies was to “prepare all health professions students for deliberatively working together with the common goal of building a safer and better patient-centered and community/population-oriented U.S. healthcare system” (IPEC Expert Panel, 2011, p. 3). They built upon the foundational work of the Institute of Medicine and the Agency for Healthcare Research, in addition to the NICF competencies, and WHO’s framework when assembling the competency framework, entitled the Core Competencies for Interprofessional Collaborative Practice (IPEC Expert Panel, 2011; Thistlewaite et al., 2014). IPEC hoped to highlight the need to extend the competencies of particular healthcare disciplines and implement interprofessional practice competencies across professions (IPEC Expert Panel, 2011). In addition, the competencies would guide IPE curriculum development and outcomes assessment, drive IPE scholarship, and integration into disciplines’ accreditation processes (IPEC Expert Panel, 2011).

The use of the term competency by the CIHC and IPEC underscored the importance of defining the behaviors graduates of healthcare professions programs
should capably engage in as part of practice, beyond what knowledge they have gained, or skills they have learned in training (Thistlewaite et al., 2014). IPEC (2011, p. 2) made a distinction between professional competences in healthcare, “Integrated enactment of knowledge, skills, and values/attitudes that define the domains of work of a particular health profession applied in specific care contexts.” Whereas, they indicated that interprofessional competence includes “Integrated enactment of knowledge, skills, and values/attitudes that define working together across the professions, with other healthcare workers, and with patients, along with families and communities, as appropriate to improve health outcomes in specific care contexts” (IPEC Expert Panel, 2011, p. 2). While some areas of competence are profession specific, others are generic in nature, and important for all health professionals (Thistlewaite et al., 2014). Some generic competencies can be achieved only through effective IPE; Barr and colleagues (2000) termed these competencies, related to learning to work with others, as collaborative competencies. From an interprofessional perspective, the Core Competencies for Interprofessional Collaborative Practice offer a blueprint for provider performance in the context of a healthcare organization (Thistlewaite et al., 2014). These competencies were updated in 2016, and the original four competencies were organized under a singular domain, of interprofessional collaboration (IPEC, 2016). In addition, their scope was broadened, in order to better reflect the elements of the Triple Aim, particularly with regard to population health (IPEC, 2016). The Core Competencies for Interprofessional Practice, listed below, offer a consistent language and behaviors for use among different health professions (IPEC, 2016).
1. Work with individuals of other professions to maintain a climate of mutual respect and shared values. (Values and Ethics for Interprofessional Practice)

2. Use the knowledge of one’s own role and other professions to appropriately assess and address the healthcare needs of patients and to promote and advance the health of populations. (Roles and Responsibilities)

3. Communicate with patients, families, communities and professionals in other health fields in a responsive and responsible manner that supports a team approach to the promotion and maintenance of health and the prevention and treatment of disease. (Interprofessional Communication)

4. Apply relationship building values and the principles of team dynamics to perform effectively in different team roles to plan, deliver, and evaluate patient/ populations centered care and population health programs and policies that are safe, timely, efficient, and equitable. (Teams and Teamwork) (IPEC, 2016, p. 10)

Similar to the NICF competencies, the competencies were designed to be client/ family centered, relationship based, and process oriented (IPEC, 2016). They are intended to connect to learning activities, teaching strategies, and behavioral assessments that are developmentally appropriate for the learner (IPEC, 2016). The competencies should be meaningful to all professions, and applicable across practice settings, recognizing that their application will vary by context (IPEC, 2016). Each competency has a set of approximately 106 specific sub-competencies, specific behaviors that support
the general competency (IPEC, 2016) (See Appendix A for the sub-competencies for each IPEC competency).

The competency of values and ethics for interprofessional practice highlights that identification of one’s values and ethics as a practitioner is part of the assembly of a professional identity that is both discipline-specific and interprofessional in nature (IPEC Expert Panel, 2011). Interprofessional values are patient-centered on individual, community, and population levels, and reflect a provider’s commitment to engaging in safe, effective, and quality healthcare and health promotion. From an interprofessional perspective, values and ethics also refer to the foundational elements of interprofessional relationships, including mutual respect, and shared beliefs (IPEC Expert Panel, 2011). This domain also encompasses respect for the differences of all team members, from patients and families, to providers, and an embrace of their unique perspectives, roles, and expertise. In addition, the establishment of honest trusting relationships that enable collaboration among all team members is emphasized (IPEC, 2016). The values and ethics competency is also included in the NICF, but is it is integrated into other competency domains, rather than existing separately (IPEC Expert Panel, 2011).

Inclusion of the domain of roles and responsibilities underscores the thinking that interprofessional collaboration requires an understanding of the ways different professions’ expertise complement each other in the provision of patient centered, population-oriented care (IPEC Expert Panel, 2011). Interprofessional team members must understand and be able to communicate the roles and responsibilities of each person on the team, in relation to their own, in order to function effectively (IPEC, 2016). In addition, team members should be able to specify the limits of their individual knowledge
and skills, while communicating the work that the team engages in collectively. Finally, the team members should demonstrate commitment to ongoing professional development that is both discipline specific and interprofessional in nature (IPEC, 2016). The roles and responsibilities competency also exists as an independent domain in the NICF (IPEC Expert Panel, 2011).

The interprofessional communication domain is considered a core component of interprofessional practice. It is also identified as a competency domain in the NICF (IPEC Expert Panel, 2011). It is essential that professionals of different disciplines are able to effectively communicate with one another and with their clients and families (IPEC Expert Panel, 2011). Discipline specific jargon is a barrier to effective communication; teams are best served by members who can organize and share information in clear and understandable ways across platforms. This competency also includes important skills such as active listening, demonstrating sensitivity to others, and using respectful language during conflict, or challenging situations (IPEC 2016).

The teams and teamwork competency domain anticipates that team members will apply relationship building values and team work behaviors in the provision of patient centered care (IPEC, 2016). These behaviors include cooperation in the delivery of care, coordination of care, and collaboration in problem solving and clinical decision making. The NICF model also includes a teams and teamwork competency domain (IPEC Expert Panel, 2011).

The competencies and sub-competencies outlined in both the IPEC and NCIF frameworks lay out the specific behaviors that are required in order to achieve the overarching competency of interprofessional collaboration. Both frameworks also
illustrate the concept that IPE is a continuum that takes place from pre-licensure education through practice (IPEC, 2016). The sub-competencies can be considered potential behavioral learning objectives to be achieved as a result of engagement in IPE. They can be linked to learning activities and assessment methods, as a means of tracking development in the larger domains (IPEC Expert Panel, 2011). The establishment of interprofessional competency frameworks has led health professions to integrate IPE into educational curricula and practice in various ways.

**Physical Therapy and Interprofessional Education**

The physical therapy profession has emerged as a key provider of healthcare in the acute care, rehabilitation, residential care, and the outpatient settings. This has occurred due to a focus on restoration and maintenance of function, movement, and pain management (Bainbridge et al., 2010). Physical therapists are valued as members of interprofessional teams that engage in collaborative practice in various settings. Interprofessional collaborative practice competencies are essential for the current and future practice of physical therapy (Bainbridge et al., 2010).

The educational preparation of physical therapists is extensive. Students are trained in programs that are accredited by the Council on Accreditation in Physical Therapy Education (CAPTE). Entry-level programs provide 3 years of graduate education, culminating in a Doctor of Physical Therapy (DPT) degree. Primary content areas in the curriculum include, but are not limited to, biology, anatomy, physiology, exercise physiology, biomechanics, kinesiology, neuroscience, pharmacology, and pathology. In addition, coursework in behavioral sciences, communication, ethics/values, management sciences, clinical reasoning, evidence-based practice, cardiovascular and
pulmonary, endocrine and metabolic, and musculoskeletal systems is provided. Eighty percent of the DPT curriculum comprises classroom and lab study and the remaining 20% is dedicated to clinical education (APTA, 2019).

Physical therapy education programs have traditionally participated in informal interdisciplinary initiatives (Wise, Frost, Davis, & Iglarsh, 2015). Given the significant role that physical therapists play in healthcare, and the development of the IPEC Core Competencies, the Council on Accreditation in Physical Therapy Education (CAPTE), recently updated accreditation guidelines to include IPE (CAPTE, 2020). Effective in 2018, the Standards and Required Elements for Accreditation of Physical Therapist Education Programs now include criteria for didactic and clinical interprofessional learning opportunities that support the development of interprofessional competencies (CAPTE, 2020). All accredited entry-level physical therapy programs must demonstrate inclusion of IPE within their curriculum and describe the ways in which they provide clinical and classroom learning opportunities (CAPTE, 2020).

**Assessment of Interprofessional Education Activities**

Accreditation guidelines have been driven by the competencies, as well as the 2015 IOM report, *Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes* (IOM, 2015). In this report, the IOM committee identified four objectives as a foundation to measuring IPE outcomes. These include the need to: align the healthcare delivery and education systems, develop a framework for conceptualizing IPE impact measurement, strengthen the evidence base for IPE and better link IPE with changes in collaborative behavior (IOM, 2015). The IOM also presented a model for measuring IPE outcomes to be validated and ultimately, adopted and adapted.
in health professions education and healthcare settings (IOM, 2015). This model, entitled the Interprofessional Learning Continuum Model (IPLCM), illustrates IPE as a spectrum of activities, occurring in undergraduate, graduate, and professional development education (IOM, 2015). It contains four related aspects, including a learning continuum, levels of learning outcomes, health outcomes of individuals and populations, and system outcomes, including organizational change (IOM, 2015). The model, which is laid out in Figure 1.1, highlights the developmental nature of IPE, and differentiates the various points in healthcare providers’ education and careers, where they would engage in IPE (IOM, 2015). It also underscores the contextual factors which may support or challenge integration of IPE in a particular setting (IOM, 2015).

Figure 1.1

The Interprofessional Learning Continuum (IPLC) Model

Figure 1.1. The IPLC Model. Reprinted from “Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes,” by the Institute of Medicine, 2015, p.29. Copyright 2015 by National Academies of the Sciences.

The outcomes of IPE across health professions have been studied, and can be measured using a modified version of the Kirkpatrick Model. The original Kirkpatrick
Model was created in the 1960s to evaluate the effectiveness of training (Hammick, Freeth, Koppel, Reeves, & Barr, 2007). It identified four levels of learning outcomes, in ascending order, from simplest to most complex. The levels included:

1. Reaction to learning
2. The learning of knowledge skills, and attitudes
3. Behavior change as a result of learning
4. Results that emerge from the learning opportunity (Hammick et al., 2007).

Barr, Freeth, Hammick, Koppel, and Reeves (2000) created an expanded version of the framework, useful for the evaluation of IPE. The modified model includes expansions of two levels (Barr et al., 2000). Level 2 is expanded, so that the modifications of attitudes/ perceptions and knowledge/ skills are separated, into Levels 2a, and 2b, respectively (Barr et al., 2000). Level 4 is also expanded, to reflect different types of outcomes. These include changes in healthcare systems (4a) or improved health outcomes of patients (4b). Table 1.3 notes the levels and descriptions of the adapted Kirkpatrick Model (Barr et al., 2000).

The literature identifies a number of limitations to the existing outcome evidence. Much of the research on IPE effectiveness reports educational outcomes at Level 1, 2a, or 2b of the adapted Kirkpatrick Model (Reeves et al., 2016). This means that as a result of the IPE activities, students report changes in their perceptions, knowledge, and skills (Hammick et al., 2007; Reeves et al., 2016). While this is positive, there is significantly less evidence of more advanced educational outcomes (Adapted Kirkpatrick Model Levels 3,4a, and 4b), in the areas of individual behavioral, organizational, or health outcome change, as a result of IPE (Reeves et al., 2016). Behavioral outcomes are
necessary to determine if students are developing the skills required to effectively execute teamwork behaviors, and demonstrate the skills required for the interprofessional collaboration competency domain (Fox et al., 2018). The IOM (2015) highlighted the need to examine and establish links between IPE and higher-level outcomes, those related to collaboration and practice behaviors in the short and long term. In addition, stakeholders, such as educational institutions and regulatory agencies, will look for this level of information in order to track IPE impact on organization improvement, individual health outcomes, and community health (Reeves, Boet, Zierler, & Kitto, 2015).

Table 1.3

<table>
<thead>
<tr>
<th>Modified Kirkpatrick Model</th>
<th>Learning Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td></td>
</tr>
<tr>
<td>1.Reaction</td>
<td>Learners views on the IPE experience</td>
</tr>
<tr>
<td>2a. Modification of attitudes/ perceptions</td>
<td>Changes in attitudes or perceptions towards the value of the team approach when caring for a client group.</td>
</tr>
<tr>
<td>2b. Acquisition of knowledge/ skills</td>
<td>Including knowledge and skills linked to interprofessional collaboration</td>
</tr>
<tr>
<td>3. Behavioral change</td>
<td>Identifies individuals’ transfer of IP learning to their practice setting.</td>
</tr>
<tr>
<td>4a. Change in organizational practice</td>
<td>Larger organizational changes, care delivery.</td>
</tr>
<tr>
<td>4b. Benefits to patients/ clients</td>
<td>Improvements in the health or well-being of patients/ clients.</td>
</tr>
</tbody>
</table>


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In their systematic review of the effects of IPE, Reeves et al. (2016) stressed the need to utilize robust, validated tools in the study of IPE, which can adequately measure higher-level outcomes. As interest in IPE grows, consequently, so do measures of IPE assessment. It is important that measures are validated appropriately before implementation. (Marlow et al., n.d.). It is also necessary for the research community to generate consensus around tools that are acceptable and appropriate for use in particular IPE contexts.

In 2012, the National Center for Interprofessional Practice and Education was founded at the University of Minnesota. It is a public-private partnership with a
cooperative agreement between the U.S. Department of Health and Human Services, the
Health Resources and Services Administration, The Josiah Macy Foundation, Robert
Wood Johnson Foundation and the University of Minnesota (National Center for
Interprofessional Practice and Education [NCIPE], 2019a). The National Center is
charged with the provision of leadership, evidence and resources needed to guide the
nation on interprofessional education and collaborative practice as a way to enhance the
experience of healthcare, improve population health and reduce the overall cost of care
(NCIPE, 2019a). It gathers, synthesizes and disseminates information and evidence about
the effectiveness of interprofessional practice and education on health outcomes. The
Center also aims to promote best practices of IPE assessment and evaluation, in order to
understand the influence of IPE on providers, patients, and health outcomes (NCIPE,
2019a).

The National Center launched a collection of IPE measurement tools shortly after
it was established, in 2014 (NCIPE, 2019b). This collection was reorganized and
redesigned in 2017, in order to address gaps that appeared in IPE assessment and
evaluation. The online collection now contains tools that address all levels of the
Modified Kirkpatrick Framework, including higher-level outcomes, which also aligns
with IOM’s (2015) IPE assessment recommendations and the IPLC model (NCIPE,
2019b). In addition, the tools specifically address IPE, but are applicable in a variety of
settings, are published with psychometric data, meet a standard of quality, serve a need,
and are accessible. The repository was built using tools obtained from a number of
literature reviews, as well as from other IPE assessment tool repositories, including the
Canadian Interprofessional Health Collaborative (NCIPE, 2019b). The measurement
collection is a resource to obtain quality assessment tools that can be used with individuals or teams, in various practice environments, and to consider the influence of IPE from a variety of perspectives (NCIPE, 2019b). Consensus of best practice as it relates to measurement tools is necessary as scholars move forward, attempting to understand the best practice of IPE pedagogy, and studying the abilities of tools to predict specific outcomes (NCIPE, 2019b).

**Problem Statement**

Most research on IPE assessment measures outcomes at the level of perceptions and attitudes (Reeves et al., 2016). Behavioral outcome information is necessary to determine if students are building the skills required to practice collaboratively, and to link IPE with development of collaborative behaviors (Fox et al., 2018; IOM, 2015). Gaps appear when comparing IPE assessment recommendations (IOM, 2015), and current literature on IPE pedagogy, assessment, and outcomes in pre-entry-level PT students. PT programs are engaging in a wide variety of IPE experiences and creatively integrating instruction into curricula. However, the assessment of these experiences is limited to mostly self-assessment tools that consider student perceptions of attitudes and beliefs about IPE. Rigorous evaluation of IPE pedagogy using validated tools that measure higher level learning outcomes, including the interprofessional competencies of PT students, is lacking in the IPE literature.

**Theoretical Rationale**

The frameworks guiding the formation of IPE experiences are diverse and, at times unclear. Many of the activities draw implicitly on principles of adult learning from Knowles and Kolb (Reeves, Goldman, Burton, & Sawatzky-Girling, 2010). Although
they are consistently formulated from the context of improved patient care through better interprofessional collaboration, it is suggested that IPE activities would offer a stronger learning experience if explicitly grounded in theory (Reeves et al., 2016).

Sociological theories of learning suggest that learning is social in nature, and that knowledge and learning are intertwined with the real-life context in which they occur (Hansman & Wilson, 2002). The knowledge gained in learning is often a result of participation, and concerns the whole person, interacting with the world (Lave & Wenger, 1991). The knowledge gained through learning in a situated context is real life, reflecting the thoughts, feelings, actions and values of the learner (Lave & Wenger, 1991).

Jean Lave and Etienne Wenger’s seminal work (1991) established situated learning theory and the concept of communities of practice. Their foundational work was based on ethnographic studies of apprenticeship, giving consideration to what concepts of apprenticeship contributed to meaningful learning (Wenger, 1998). Lave and Wenger’s theory of situated learning emphasizes learning as a result of interaction with the world (Lave & Wenger, 1991). It builds upon few central premises about learners, knowledge, and learning. First, humans are inherently social beings, and this social nature is central to the process of learning (Wenger, 1998). Next, knowledge is defined as competence in a set of skills and tasks, such as a profession, which adds value to a group (Wenger, 1998). Finally, the purpose of learning is to support one’s ability to experience the world and engage in a meaningful way (Wenger, 1998). Based on this foundation, learning is framed as an experience of social participation, active engagement in the practices of a
community, and identity formation within the community (Wenger, 1998). It requires action and connection.

Humans engage in enterprises of all kinds, from those that sustain life, to those that entertain, to those that serve a profession and earn a living. People interact with each other, engage with the world in the pursuit of enterprises. They adjust their actions and behaviors as a result of their outcomes (Wenger, 1998). This adjustment is considered learning. Communities formed over time, based on groups of people who pursue shared enterprises. The learning of individuals in the community accumulates, and results in the formation of practices that reflect the shared work and social relationships of the group (Wenger, 1998). These types of communities are defined as communities of practice (Wenger, 1998).

Communities of practice exist throughout all aspects of life, and may be formal, or informal. They range from family units, to workplace departments, from church organizations to musical groups. Although they have varied reasons for formation and existence, they share a common endeavor, engage in collective learning, and improve in the achievement in their common purpose through regular interaction (Wenger, 1998).

Situated learning is applicable to IPE and the development of interprofessional competencies. Healthcare students form communities of practice within their profession specific disciplines throughout their professional training. In addition to learning specific knowledge and skills, they are brought up in the culture of their professional discipline (Sterrett, Hawkins, Herweck, & Schreiber, 2015). IPE promotes interprofessional learning, and the development of an interprofessional identity, particularly with participation in an interprofessional community or group (Sterrett et al., 2015). During
IPE, individuals work together in a community of practice, and exchange tacit knowledge through observations, stories, interaction and teamwork, in order to build collaborative practice (Sargeant, 2009). The group, or community, in pursuit of common work is primary (Sterrett et al., 2015). The building of interprofessional relationships, culture, and practices that cross the boundaries of discipline is promoted and embraced (Mann et al., 2008). Interactions between group members are based on the collaborative work toward common goals, and over time, these interactions develop into practices that members of the team engage in their common work (Gudmunsen et al., 2019).

There are a variety of studies published in the IPE literature that utilize situated learning and communities of practice as a theoretical framework. For example, Gudmunsen and colleagues (2019) and Sterrett (2010), qualitatively considered health professions students’ mutual engagement during an IPE experience, to better understand the development of skills required for communities of practice. Lee and Meyer (2011), used communities of practice to describe and evaluate the pedagogy of a professional development IPE program for healthcare workers, while Sterrett and associates applied a similar lens to students who were pre-licensure (2015). Others (McLoughlin et al., 2018; Pratte et al., 2018) have studied the use of virtual communities of practice as an alternative model of instructional design in IPE. The very definition of IPE created by CAIPE (1997), embodies many components of situated learning theory, and correlates to different aspects of various IPE experiences.

**Statement of Purpose**

The purpose of this study is to understand the influence of an educational experience on the interprofessional values and behaviors of Doctor of Physical Therapy
students, as compared to a control group of peers, and to students of other disciplines who also participated in the IPE experience.

**Research Questions**

Based on the problem that has been identified with regard to the assessment of IPE, and the purpose of this research, the following research questions have emerged:

1. What is the effect of an IPE experience on Doctor of Physical Therapy students’ reported interprofessional values and behaviors?

2. How do Doctor of Physical Therapy students’ interprofessional values and behaviors compare to students of other disciplines who participate in the same IPE experience?

**Potential Significance of the Study**

Information from this research may inform schools’ choice of pedagogy when implementing IPE, and advance scholarship in the field related to teaching and learning, assessment, and outcomes. This will support programs as they strive to prepare practitioners who are equipped to engage in interprofessional collaborative practice in the provision of patient centered care. It will also answer the call of health professions accreditation organizations, as they continue to specify IPE as a required curricular element for program accreditation.

**Definitions of Terms**

*Interprofessional Collaborative Practice*- When multiple health workers from different professional backgrounds work together with patients, families, carers, and communities to deliver the highest quality of care (WHO, 2010, p. 13).
**Interprofessional Competencies in Healthcare**-Integrated enactment of knowledge, skills, and values/attitudes that define working together across the professions, with other healthcare workers, and with patients, along with families and communities, as appropriate to improve health outcomes in specific care (IPEC Expert Panel, 2011, p. 2).

**Interprofessional Education** - Students from two or more professions learn about, from, and with each other, to improve collaboration, and the quality of patient care (Centre for the Advancement of Interprofessional Education [CAIPE], 1997, p. 19).

**Chapter Summary**

Over the past two decades, there have been calls to improve the safety, efficiency and the quality of the healthcare system in the United States. The provision of team-based care has been identified as a central element of patient centered healthcare. This type of care requires interprofessional collaboration. In order to respond to the changing healthcare environment, schools that educate healthcare professionals must equip them with a secondary skill set, of interprofessional competencies, through interprofessional education (IPE). Interprofessional competency frameworks have been developed to guide curriculum development, accreditation standards and research into best practices and outcomes.

Physical therapy is a profession that participates in interprofessional collaborative practice, and physical therapist education programs have recently been mandated to include IPE in their curriculum (CAPTE, 2020). A gap exists within the literature as to the best interprofessional education practices that will achieve higher level learning outcomes, such as changes in behavior, and interprofessional competency, as well as the
use of robust, validated measurement tools. Chapter 2 will examine the literature regarding teaching and learning strategies used in IPE within physical therapist education programs, and consider the outcomes of these interventions. In addition, it will highlight the tools utilized in outcome measurement. Chapter 3 will discuss the methodology employed in this study, while Chapter 4 will present the results of the research. Finally, Chapter 5 will offer a discussion of the findings and suggest recommendations based on the analysis of the results.
Chapter 2: Review of the Literature

Introduction and Purpose

In recent years, the education of healthcare professionals has evolved as faculty and students have pursued the transformation of the healthcare system and better patient outcomes (Kerfield, Pitonyak, & Jirikowic, 2017). Interprofessional education (IPE) has been an integral component of this change. In addition to demonstrating discipline specific skills, health professionals must understand each other’s roles, communicate effectively within the healthcare team, actively collaborate, and coordinate care, in service to their clients (Lockeman et al., 2017; Sytsma, et al., 2015). In 2003, the Institute of Medicine (IOM) published its *Bridge to Quality* report indicating that, health professionals should be educated to deliver evidence-based care as members of interprofessional teams (Knebel & Grenier, 2003).

In 2011, the Interprofessional Education Collaborative (IPEC) created a set of core competency domains for interprofessional education, to offer a common language for IPE, drive curriculum and accreditation standards, and facilitate scholarship, which were updated in 2016 (IPEC, 2016). These competencies include values and ethics for interprofessional practice, roles and responsibilities for collaborative practice, interprofessional communication practices, and teams and teamwork practices, all under the umbrella of the interprofessional collaboration competency domain (IPEC, 2016). Each competency domain contains a set of sub competencies identifying specific behaviors associated with the practice (IPEC, 2016). (See Appendix A for a list of the
competencies and their associated sub competencies.) Health professions associations have supported the development of the IPEC core competencies, and expectations for the provision of IPE within education curricula are being articulated with increasing frequency by professions’ accrediting bodies (Del Rossi et al., 2017). The American Physical Therapy Association endorsed the IPEC core competencies in 2014, and the Committee on Accreditation of Physical Therapy Education included IPE as a standard of entry-level physical therapist education, effective 2018 (Arth et al., 2018; Del Rossi et al., 2017).

Accreditation guidelines have been driven by the competencies, and the IOM’s 2015 report, *Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes* (IOM, 2015). In this report, the IOM committee identified four objectives as a foundation to measuring IPE outcomes. These include the need to: align the healthcare delivery and education systems, develop a framework for conceptualizing IPE impact measurement, strengthen the evidence base for IPE and better link IPE with changes in collaborative behavior (IOM, 2015). The IOM also presented the Interprofessional Learning Continuum Model (IPLC) for measuring IPE outcomes to be adopted and adapted in health professions education and healthcare settings (IOM, 2015). A range of IPE activities can be linked to learning outcomes.

The establishment of the IPEC competencies, IPLC model, and program accreditation standards have driven particular health profession education programs, such as physical therapy (PT), to evaluate how IPE is delivered within its curriculum and assess the outcomes of learning activities. It is necessary for PT programs to understand if their methods of pedagogy are effective, if they are adequately meeting accreditation
standards, appropriately allocating resources, and preparing clinicians to practice collaboratively. The purpose of this review is to identify the various methods of IPE pedagogy presented in the literature that are inclusive of physical therapy students, to examine their use of validated assessment tools, and associated outcomes. The content of learning strategies and the selection of assessment tools will be considered in detail, due to the fact that significant variation exists in the literature at this time. Assessment tools will be introduced and described as they are utilized in the context of the IPE experiences.

Methods

The scientific articles utilized in this literature review were gathered using a methodical, multiple step process. A search of the scholarly, peer-reviewed literature was conducted, inclusive of the years 2010-2019. These dates were selected based upon the recent proliferation of interprofessional education research in the literature, and the corresponding timeline with the establishment of the IPEC competencies. Searches were administered in PubMed, CINAHL, ProQuest Nursing and Allied Health, and ProQuest Education databases, in order to thoroughly explore the healthcare and education literatures. The terms, “interprofessional education,” “physical therapy students,” and “outcomes, and/ or teamwork,” were used when building searches, in order to specifically target recent IPE research inclusive of physical therapy students. In order to narrow the search results within the ProQuest Nursing and Allied Health Database, the MeSH headings of “interprofessional relations,” “cooperative behavior,” “curriculum,” and “patient care team” were applied. Hand reviews of pertinent journals, including the Journal of Physical Therapy Education, and the Journal of Interprofessional Care took
place, in addition to citation tracking of the references from published reviews of interprofessional education found in the literature.

Articles that documented interprofessional, multidisciplinary, or collaborative education between pre-licensure physical therapy students and at least one other profession were included in this review. Pre-licensure physical therapy students were defined as students enrolled in a physical therapist education program, in the professional phase of physical therapist education curriculum, which culminates in an entry-level physical therapist degree, at the masters or doctoral level (Arth et al., 2018). The review excluded interprofessional education experiences that took place while the students were engaged in a full-time supervised clinical placement. The included IPE experiences occurred in the context of the physical therapy curriculum, or as part of an institution’s larger interprofessional education curriculum, and included in person, face-to-face learning activities. This review was limited to quantitative and mixed methods studies that utilized a previously validated outcome measure related to interprofessional learning or interprofessional practice. In addition, studies taking place outside of the United States and Canada were excluded.

The searches identified 16 articles appropriate for inclusion in this review, considering the above parameters. Studies were classified according to their use of teaching and learning strategies. These included singular, experiences \( (n = 5) \), and multifaceted IPE experiences \( (n = 10) \). Singular IPE experiences were based upon one learning event with one specific methodology. All of the singular IPE events in this review were simulation experiences. Multifaceted IPE experiences utilized a variety of approaches to teaching and learning activities. Specific types of learning experiences
were highlighted, including simulation \((n=7)\), content-based labs \((n=4)\), community-based experiences \((n=2)\), and introductory IPE \((n=2)\). In addition, consideration was given to experiences that provided explicit instruction related to principles of teamwork, or interprofessional collaboration as part of the content \((n=6)\), versus those that did not \((n=9)\). Once categorized, assessment via the use of validated tools was noted, as well as the outcomes of the educational events, both on a large scale, and as they related to physical therapy students.

**Significant Empirical Findings**

The literature included in this review was categorized according to the primary teaching and learning methods used, noting the variability in factors such as frequency, duration, and setting of the IPE experience. In addition, the assessment of IPE outcomes was considered, noting the measurement tools used and the level of learning the tools assess. Finally, the connections between IPE activities, learning objectives, and assessment tools were explored within the literature.

**Teaching and learning methods.** A variety of teaching and learning methods were utilized in the studies reviewed. The frequency and duration of learning experiences were variable. They ranged from a short duration activity, (Karpa et al., 2018; Wellmon, Lefebvre, & Ferry, 2017) to a one-credit semester long course, (Lockeman, et al., 2017; Ruebling et al., 2014), to an intermittently occurring modular program spanning 2 years (Arenson, et al., 2015). In addition to the variable time structure, IPE experiences were integrated into curricula using differing instructional delivery models, including integrated curriculum driven experiences (Del Rossi et al., 2017; Sytsma et al., 2015), community based educational programming (Arenson, et al., 2015).
2015; Reilly et al., 2014), and standalone experiences (Lockeman et al., 2017; Ruebling et al., 2014; Turkelson et al., 2018). The literature also discussed a spectrum of pedagogical methods for IPE experiences, including didactic lecture, self-directed learning, simulation, content-based lab experiences, small interprofessional group learning, teamwork training, and patient interaction experiences.

Despite the assortment of delivery models and pedagogy, the review identified some patterns, first in the complexity of the structure of the IPE experience. Ten studies reported multifaceted experiences that contained learning events with multiple components. The number and combination of learning activities varied throughout these multifaceted experiences, but each possessed a core teaching methodology, or learning activity that the IPE experience was structured around. This review is structured around the core learning activities identified in each IPE experience. Five studies utilized a singular learning activity as the IPE experience. (Karpa, et al., 2018; King, et al., 2016; Lefebvre, Wellmon, & Ferry, 2015; Rossler & Kimble, 2016; Wellmon et al., 2017). All of the singular IPE experiences were patient simulations. Due to the similar methodology for all the simulations reviewed, the singular, simulation-only experiences will be described in context with simulations that were part of a multifaceted IPE experience. However, the assessment and outcomes of the singular, simulation only experiences will be discussed separately from simulations that were part of a multifaceted IPE experience.

**Simulation.** Medical simulations are used with increasing frequency in healthcare professions’ educational programs, including physicians, physical therapy, nursing, and occupational therapy, as they allow students to practice clinical decision-making skills in a low risk environment (Lefebvre et al., 2015). Simulation also allows students from
multiple disciplines to work together as a team, and has been noted to develop student attitudes about interprofessional collaboration (Lefebvre et al., 2015). Simulations can employ different methodologies when recreating clinical scenarios, including standardized patients and high-fidelity patient simulation mannequins (King et al., 2016). Standardized patients are trained individuals who act in the role of patients, mimicking the appropriate signs and symptoms for a given condition (King et al., 2016). Actors portraying standardized patients are able to offer a variety of students consistent responses over time in a manner that is not possible with authentic patients (King et al., 2016). High fidelity patient simulation mannequins are computerized, interactive, responsive human simulators that can be programmed to provide physiological responses, such as blood pressure, heart rate, and lung sounds (King et al., 2016).

Description. Seven studies engaged in simulation in the IPE experience. (Garrido, Dluglasch, & Graber, 2014; Karpa, et al., 2018; King, et al., 2016; Lefebvre et al., 2015; Rossler & Kimble, 2016; Turkelson et al., 2018; Wellmon et al., 2017). Four studies included the use of a standardized patient (Garrido et al., 2014; Karpa, et al., 2018; Rossler & Kimble, 2016; Turkelson et al., 2018), two studies utilized high fidelity patient simulators (Lefebvre et al., 2015; Wellmon et al., 2017), and one study used both (King et al., 2018).

The simulation activities ranged 30 to 90 minutes in length (Garrido et al., 2014; Karpa, et al., 2018; King, et al., 2016; Lefebvre et al., 2015; Rossler & Kimble, 2016; Turkelson et al., 2018; Wellmon et al., 2017). The structure of the event was similar in all studies. Karpa et al. (2018) and Lefebvre et al. (2015) provided all students a summary of the case ahead of time, and an updated patient report upon arrival, prior to
beginning the simulation, while the others did not. Each simulation included a short pre-brief time, for students to meet and generate a session plan. After the 15-minute pre-brief, students moved on to the interprofessional simulation, lasting 20-30 minutes (Garrido et al., 2014; Karpa, et al., 2018; King, et al., 2016; Lefebvre et al., 2015; Rossler & Kimble, 20181; Turkelson et al., 2018; Wellmon, et al., 2017).

Two of the high-fidelity simulations (Lefebvre et al., 2015; Wellmon, et al., 2017) required physical therapy and nursing students to collaborate in caring for a patient in the intensive care unit who required assistance to get out of bed for physical therapy. In the course of the PT session, the patient became unstable, and suffered a cardiac arrest. The students were required to work together to manage the medical emergency and execute the code response until the patient’s vital signs stabilized (Lefebvre et al., 2015; Wellmon, et al., 2017). The teamwork in these situations was generated by the need to attend to the patient with a significant and unexpected health status change.

The other simulation experiences presented cases of complex patients in the acute or urgent care settings (Garrido et al., 2014; Karpa, et al., 2018; King, et al., 2016; Rossler & Kimble, 2016; Turkelson et al., 2018). Karpa et al. (2018) presented a patient who had suffered a stroke, and was currently a hospital patient with ongoing rehabilitation and social service needs. This simulation included six types of health professions students, including PT, occupational therapy, nursing, physician assistant, pharmacy, and medical students from different institutions. Similar types of event were noted in Turkelson et al. (2018), who presented a patient with multiple sclerosis and a humerus fracture and King et al., (2016) who selected a case involving chronic obstructive pulmonary disease and a hip fracture. In a similar manner, students of
multiple professions were required to collaborate around the care of a patient with complex needs, manage medical events, and create a disposition plan.

Social and cultural situations, including limited finances, lack of family support, (Rossler & Kimble, 2016) and varied religious beliefs (Garrido et al., 2014) were layered into some simulation scenarios. In contrast to the other emergency-based scenarios, students were required to use their discipline-specific knowledge, social awareness, and cultural competence to provide patient-centered care, and cooperatively facilitate an appropriate discharge plan. Teamwork was developed through communication, the sharing of information, and cooperative problem solving in service to a patient’s global needs.

Each simulation concluded with a faculty facilitated debrief with the interprofessional group, and lasted 10-60 minutes (Garrido et al., 2014; Karpa, et al., 2018; King, et al., 2016; Lefebvre et al., 2015; Turkelson et al., 2018; Wellmon, et al., 2017). The debriefings ranged from short unstructured discussions, (Lefebvre et al., 2015) to moderate length with guiding questions regarding teamwork and collaboration (Karpa et al., 2018) to extensive and structured (Wellmon et al., 2017). Wellmon (2017) cited evidence that indicates debriefings should last equally as long as simulation experiences, in order to allow for deep and focused self-reflection, which promotes understanding of the need for collaboration. Wellmon et al. (2017) engaged a four-phase approach, in order to identify critical events, analyze decisions, and summarize lessons learned. Additionally, Turkelson et al. (2018) engaged in an extended structured debrief, using the Plus Delta Framework, which focuses on identification of successes and failures in the simulation. Two studies (King, et al., 2016; Turkelson et al., 2018) held a
large group debriefing session after the small interprofessional team debriefs, where multiple interprofessional groups assembled to discuss and reflect upon the experience.

Assessment and outcomes of singular, simulation only experiences. Karpa et al. (2018) used the IPEC Self-Assessment tool as a quantitative method of assessing students from five health professions’ change in perceptions of interprofessional values and interprofessional interactions before and after a simulation scenario involving a patient status post stroke, as described above. The IPEC Self-Assessment is a tool derived from the IPEC competencies that was originally validated as a 42-item tool, and later refined to 16 items in two domains, the interprofessional values domain and the interprofessional interaction domain (Dow et al., 2014; Lockeman et al., 2017). Items are based on a 5-point Likert scale (1= strongly disagree, 5= strongly agree) and students respond to questions beginning with the prompt, “I am able to…” (Lockeman et al., 2017). Karpa et al. were the only group to utilize this competency-based self-assessment in the review.

In Karpa et al.’s study, survey participation was voluntary. Six hundred thirty-nine students participated in the experience, including 289 medical students, 126 nursing students, 85 occupational therapy students, 71 physical therapy students, 61 physician assistant students, five pharmacy students and two social work students. The survey was completed by 296 of 639 students, approximately a 46% response rate. Pharmacy and social work students were not assessed, due to low numbers. The differences in students over time were analyzed by discipline, and statistically significant changes ($p<.05$) were noted in PT and medical students in both the domains of the tests. PT students mean change in the values domain of the test was 2.50, 95% CI (1.44, 3.56), and 1.42 in the interactions domain was 1.42, 95% CI (.07, 2.76), whereas the medical students change
was noted to be 0.82 in the values domain, 95% CI (0.18, 1.46) and 1.84 in the interactions domain, 95% CI (0.94, 2.73). This indicates that both of these groups of students demonstrated improvements in their self-perceived values and behaviors, as related to interprofessional collaboration. Nursing and occupational therapy students both demonstrated improvements in the interaction domain of the measure only. Karpa did not report aggregated data on the students’ change pre and post simulation experience, and did not provide enough detail in data to calculate effect size (2018).

King and associates (2016) utilized the Interprofessional Collaborative Competency Attainment Survey (ICCAS) in their small, quasi-experimental pre-post intervention study comparing a simulation scenario utilizing a standardized patient versus a mannequin simulator. The ICCAS, which was developed in English and French, is based on the Canadian Interprofessional Health Collaborative Competencies, including communication, collaboration, roles and responsibilities, and team function; these are very similar to the Core Competencies for Interprofessional Practice that have been developed by IPEC in the US (Archibald, et al., 2014). The ICCAS is a self-assessment tool that measures perceptions of the collaboration competency. The original version of the tool, which was used in this study, is based on a 7-point Likert scale, where higher scores indicate higher perceived competences (1= strongly disagree, 7= strongly agree) (Archibald et al., 2014). The tool was originally validated as a retrospective pre-post assessment tool (Archibald et al., 2014). However, in their study, King et al. used the tool in a traditional pre-post format (King et al., 2016).

King et al. compared changes in students’ perceived competency on the ICCAS pre and post simulation using a standardized patient ($n= 43$) versus a simulator ($n=13$).
Analysis did not demonstrate a significant difference between the overall scores of the assessment under the varied conditions. However, paired t-tests revealed statistically significant differences in the pre-post score changes of two subtests related to roles and responsibilities and conflict management. Limited information did not allow the calculation of effect size in an accurate manner. Students perceived much less growth in their ability to manage conflict and to manage their roles in the experience utilizing a standardized patient. The authors did not provide data broken down by discipline in their work, and did not note any statistically significant changes of students’ pre-post scores within an experience as a whole.

In their high fidelity cardiac arrest simulation involving PT and nursing students, Lefebvre et al., (2015) used multiple assessment measures including the Interdisciplinary Education Perception Scale (IEPS), the Attitudes Toward Health Care Teams Scale (ATHCTS), the Readiness for Interprofessional Learning Scale (RIPLS), and Team Skills Scale (TSS), as a means of examining changes in beliefs and attitudes toward interprofessional collaboration after a high fidelity patient simulation experience. The Interdisciplinary Education Perception Scale (IEPS) is an 18-item attitudinal scale that measures student perceptions of the ability of others in their discipline to collaborate with other disciplines (Lefebvre et al., 2015). It contains four subscales measuring characteristics required for interprofessional collaboration, including competency and autonomy, need for cooperation with other disciplines, perception of actual cooperation and value comprehension of the other disciplines (Lefebvre et al., 2015). Items are rated on a 6-point Likert scale (1= strongly disagree, 6= strongly agree) and higher scores indicate more positive attitudes on this self-report measure, which ultimately adds
individual items to achieve a total score (Lefebvre et al., 2015). Four studies utilize the IEPS in this review.

The Readiness for Interprofessional Learning Scale (RIPLS) is a tool that aims to assess preparedness for IPE and collaborative learning activities related to interprofessional practice. This self-assessment tool has been utilized to measure attitudes that occur as a result of IPE experiences. The revised RIPLS is a 19-item measure containing a 5-point Likert scale (1= strongly disagree, and 5= strongly agree); individual items are added to arrive at a summary score (McFayden, 2005). Within the 19 items, four subscales exist, which consider teamwork, team roles, and negative and positive professional identity. Higher scores indicate more positive attitudes toward IPE (McFayden, 2005). Reliability of the scale has been examined, and Chronbach’s α for the total scale has been reported at 0.85, and 0.89 (McFayden, 2006). Internal consistency has also been determined for the teamwork subscale (α = 0.88), the negative professional identity subscale (α= 0.76), the positive professional identity subscale (α = 0.81), and the roles and responsibilities subscale (α= 0.43) (McFayden, 2006). Eight studies use the RIPLS in this review.

The Attitudes Towards Health Care Teams Scale (ATHCTS) measures the collaborative attitudes of team members in three domains, including team value, team efficiency and shared leadership (Lefebvre et al., 2015). This 21-item tool uses a 6-point Likert scale (1= strongly disagree, 6= strongly agree). Scores are summed and high scores indicate positive collaborative attitudes. The ATHCTS is often used in conjunction with the Team Skills Scale (Lefebvre et al., 2015). Four studies in this review use the ATHCTS.
The Team Skills Scale is a 17-item self-assessment measure that utilizes a 5-point Likert Scale (0 = poor, 5 = excellent) (Lefebvre et al., 2015). The scale considers perceptions of the function of an interprofessional team, as they relate to attitudes and discipline specific skills (Lefebvre et al., 2015). A total score is computed, and higher scores indicate positive perceptions of teamwork skills (Lefebvre et al., 2015). The Team Skills Scale was utilized in a single study synthesized in this review.

Lefebvre et al. discussed the responses of PT students only (n=34) in their work. After conducting paired t-tests of the mean pre and post scores of the four assessment tools, statistically significant positive differences were noted related to teamwork and collaboration attitudes, \( p<0.05 \), with low and moderate effect sizes (Lefebvre et al., 2015). All changes were found at the subscale level of assessment. Improvement of attitudes related to competency/autonomy was identified on the IEPS (Cohen’s \( d = 0.38 \)). Improved perceptions of teamwork and collaboration were noted on subscales of both the ATHCS (\( d = 0.44 \)), and the RIPLS (\( d = 0.44 \)). Growth in perceptions of shared leadership was also observed on the ATHCTS. This indicates new importance placed on team-based decision making, rather than leadership by a single professional. Finally, significant changes were noted on the Team Skills Scale, indicating the improved function of the team, and better understanding of the contributions members make (\( d = 0.44 \)). The authors hypothesized that the nature of the simulation, which involved an emergency, stimulated a new level of teamwork, and the PT students were required to rely on the knowledge and skills of the nursing students in order to achieve a successful outcome (Lefebvre et al., 2015).
Wellmon et al. (2017) also utilized the RIPLS, the IEPS, and the ATHCTS in their study of a high-fidelity simulation of 77 PT (n = 42) and nursing students (n = 35) involving a cardiac arrest. However, unlike Lefebvre et al., their study included a control group of volunteer PT and nursing students at the same point of education, who had no exposure to IPE. The statistical analysis included a two by two repeated measures ANOVA, comparing IPE learning versus control groups, and pre simulation versus post simulation responses on the assessment tools. A post hoc analysis was also completed, with the use of Tukey’s honestly significant difference test (Wellmon et al., 2017).

The learning and control groups were statistically similar in subtest scores assessments prior to intervention (Wellmon et al., 2017). The analysis highlighted statistically significant changes in the IPE learning group over time, and as compared to the control group, with primarily moderate effect sizes. This occurred in three of four subtests of the IEPS (d = 0.61, 0.64, and 0.59) and two subtests of the RIPLS (d = 0.68, 0.71), and the ATHCTS (d = 0.70, 0.45). These results are consistent with the results of Lefebvre, indicating the influence of the simulation on students’ readiness for, attitudes about, and perceptions of IPE and interprofessional collaboration (Wellmon et al., 2017).

In their study exploring the varying readiness of PT (n = 8), nursing (n = 25), health administration, (n = 10) and respiratory therapy students (n = 10, total student n = 53) to participate in IPE before and after a simulation experience, Rossler and Kimble (2016) used two tools, the RIPLS, and the Health Profession Collaboration Scale (HPCS) (Rossler & Kimble, 2016). The HPCS measures perceptions of collaboration through the simulation experience (Rossler & Kimble, 2016). The 12-item instrument relies on a 5-
point Likert scale and higher scores indicate more positive perceptions of collaboration (Rossler & Kimble, 2016).

During data analysis, Rossler and Kimble (2016) identified a non-normative sample distribution, and used non-parametric methods of statistical analysis. The internal consistency of each instrument and subscale was also recalculated, using Chronbach’s α, and noted to be acceptable, with the exception of the roles/ responsibilities subscale of the revised RIPLS, which was identified as low; however, a value was not provided (Rossler & Kimble, 2016). A Wilcoxon signed ranks test, the non-parametric equivalent of a t-test, tracked changes in the group at large over time. Statistically significant improvements were noted in the whole group after the simulation on three of four subscales of the RIPLS, excluding the roles and responsibilities scale, $p < 0.01$, with low and moderate effect sizes ($d = 0.41, 0.21, 0.25$). This indicated a global improvement in student readiness for interprofessional learning pre to post simulation, which is similar to the earlier studies reviewed.

Rossler and Kimble (2016) also utilized a Kruskal-Wallis test, the nonparametric version of a one-way ANOVA, to examine differences within the post simulation scores for each discipline between the revised RIPLS subscales and the HPCS. This analysis revealed significant differences between the negative professional identity subtest and the HPCS for PT students versus other disciplines, indicating that PT students placed lower value on interprofessional collaboration in this experience. A Mann Whitney U test revealed that PT students had significantly more negative attitudes about readiness for interprofessional learning and collaboration than their health administration and nursing counterparts (Rossler & Kimble, 2016). Rossler and Kimble questioned whether this
simulation scenario involving a geriatric patient with multiple medical problems, and an ankle sprain, was authentic to the practice of PT, and if that contributed to students less positive responses. In addition, the authors suggested that PT students began the study with a high level of professional identity and competence, which may not have changed much in the course of a short simulation (Rossler & Kimble, 2016).

Assessment and outcomes of simulation as a multifaceted learning experience. As indicated earlier, some studies utilized simulation as part of a multi-faceted learning experience with other IPE components. These included the work of Garrido et al. (2014), and Turkelson et al. (2018). Garrido et al. (2014) discussed their prospective pre-post study design, which examined the response of 108 PT (n=55), athletic training (n=24) and family nurse practitioner (n=29) students to a simulation that was both interprofessional and culturally responsive in nature. The students involved in this IPE experience also engaged in specific teamwork and collaboration training, whose pedagogy will be addressed later in this review. Garrido et al. (2014) utilized the ATHCTS as a voluntary pre-post assessment tool for this experience, and procured a 51% response rate (n=55). As a group, no changes occurred over time overall, on subtest analysis, or analysis by discipline. However, the authors noted the trend that PT students valued shared team leadership over physician leadership. This could have reflected their professional culture and knowledge of their professional role, or it could have been due to student’s relative inexperience. The nurse practitioner students valued physician leadership over shared team participation, which reflects a more traditional model of care. In addition, the nurse practitioner students were working nurses, years into their nurse practitioner program. As clinicians, they have built and retained perceptions about
physician and nurse practitioner leadership, based on their education and working experiences. Unlike the other simulations, where subtest level changes were noted on the ATHCTS, no changes were detected in this study. The authors considered the small sample size and corresponding lack of statistical power, as well as low survey response rate a limitation of their report (Garrido et al., 2014).

Turkelson et al. (2018) also used a prospective pre-post study design to consider the influence of their multifaceted IPE experience, including a simulation, on PT ($n=57$), nursing ($n=39$), and nurse practitioner ($n=6$) students. This study of 102 students also engaged in specific teamwork training, which will be addressed later, in context with the other types of collaborative instruction offered to students in this review. Similar to previous studies, Turkelson utilized the IEPS and the RIPLS. Whole group and discipline specific pre-post learning intervention changes were measured using the Wilcoxon signed rank test, the nonparametric equivalent of a t-test. Statistically significant improvements were noted over time in the large group on three of the RIPLS subscales, including teamwork/collaboration, negative professional identity, positive professional identity, with low and moderate effect sizes ($d=0.42, 0.62, 0.34$) but not roles and responsibilities. No statistically significant changes were noted on the IEPS. Students reported high positive attitudes at beginning and end of the experience (Turkelson et al., 2018).

Turkelson noted as a limitation the unbalanced number of students, requiring the nurse practitioner students to participate in the simulation multiple times, which could have influenced their attitudes and behaviors in simulation, despite the fact that they completed the post assessment after the first survey. The authors also noted that other
measures might have more effectively captured behaviors that were demonstrated in the simulation and developed over the course of the IPE experience (Turkelson et al., 2018).

**Summary of key points from simulation experiences.** The studies incorporating simulation encompassed a variety of scenarios, number and type of health professions, methodologies, tools and statistical analysis. Despite this, some themes emerged. The most commonly used tools were self-assessments measuring beliefs, attitudes, perceptions, and readiness for IPE. These tools included the RIPLS, IEPS, and ATHCTS. Statistically significant improvements in these qualities were demonstrated on the subtests of the RIPLS related to teamwork, positive, and negative professional identity in multiple studies with low and moderate effect sizes, but not roles and responsibilities. Improvements in the competency/autonomy subscale of the IEPS were also noted in multiple studies, with moderate effect sizes. Improvements in the other subtests of the IEPS and in the ATHCTS occurred in singular simulation studies with moderate effect sizes documented.

**Content-based labs.** The discipline specific curricula of healthcare professions education programs often contain overlapping content areas that have provided instruction in isolation, but are potential opportunities for IPE (Del Rossi et al., 2017). IPE learning opportunities also exist among students of disciplines that are natural partners as providers within particular settings in the healthcare system (Bondoc & Wall, 2015). Learning activities were classified as content-based labs if they were IPE interactions driven by content specific coursework that was simultaneously occurring in each discipline’s curricula.
Description. Four studies utilized content-based lab experiences as part of their multifaceted IPE approach (Bondoc & Wall, 2015; Del Rossi et al., 2017; Kerfield et al., 2017; Sytsma et al., 2015). Each of the content-based labs involved PT students and one or two other disciplines. PT and occupational therapy students collaborated in three cases on labs tied to pediatric or neurological rehabilitation course work (Bondoc & Wall, 2015; Kerfied et al., 2017; Del Rossi et al., 2017). One of these instances also involved nursing students (Del Rossi et al., 2017). In another case, PT and medical students interacted in the context of a gross anatomy lab (Sytsma et al., 2015). In each of these experiences, students brought their discipline’s unique knowledge and point of view to an area of common content.

Gross anatomy is a foundational course in medical and PT education curricula, and a natural point of intersection in each profession’s training (Sytsma et al., 2015). Sytsma and associates’ work discussed students learning about and from each other in the context of salient subject matter. PT school anatomy focuses on the musculoskeletal system, while medical school anatomy emphasizes thoraco-abdominal organ-based systems (Sytsma et al., 2015). In this IPE experience, after a social icebreaker, PT and medical students formed interprofessional groups to participate in two lab sessions. In the gross anatomy lab, PT students led medical students through a dissection of the upper extremity. Then medical students led PT students through an abdominal dissection and demonstrated the use of various imaging technologies. Following this, the interprofessional groups spent classroom time answering questions and solving problems related to paper cases. They were required to utilize their knowledge bases to arrive at a
differential diagnosis as a group, and present these conclusions as a team (Sytsma et al., 2015).

In contrast to foundational science as IPE content, the other cases of content-based labs involved IPE with PT and occupational therapists in courses related to natural areas of collaborative practice. These included pediatrics (Del Rossi et al., 2017; Kerfield et al., 2017) and neurological rehabilitation (Bondoc & Wall, 2015). Although differing in subject matter, Bondoc & Wall (2015) and Kerfield et al. (2017) highlighted similar IPE experiences, where students participated in multiple labs, engaged in small group case based learning, discussed the perspectives of interprofessional team members in the care of the population, and completed an group assignment as an interprofessional team (Bondoc & Wall, 2015; Kerfield et al., 2017). Del Rossi et al. (2017) described a one-time content-based lab experience entitled, “Baby Lab.” This IPE experience brought PT, nursing, and occupational therapy students together in order to interact with infants and toddlers of different ages and their parents, to gain a firsthand understanding of normal development across domains (Del Rossi et al., 2017). Students first individually prepared an assignment to ensure their personal understanding of required content. Just prior to the lab, students met as a team and finalized a plan of observation, play activities, and parent interview questions. The Baby Lab activity concluded with a large group debrief and an individual reflective writing assignment (Del Rossi et al., 2017). The involvement of children and their parents from the community was a unique component of this IPE experience, as their participation created an authentic type and circumstance of interaction that would have been difficult to capture with a simulated experience (Del Rossi et al., 2017).
Assessment and outcomes of content-based labs. Systma et al. (2015) utilized the revised RIPLS in their prospective pre-post study of the influence of a gross anatomy lab experience between 76 PT (n=28) and medical (n=48) students. The assessments were voluntary, and a response rate of 64% was achieved for physical therapy students and 73% for medical students. Using the Wilcoxon Signed test, Systma and her colleagues were unable to detect any pre-post change on any of the RIPLS domains (2015). Students demonstrated readiness for IPE and positive attitudes overall, with high scores at the pre and post-assessment times. In addition, medical students indicated higher levels of personal understanding of their roles than the PT students on the Roles and Responsibilities subscale (Systma et al., 2015). It is worth noting that the roles and responsibilities subtest of the RIPLS has previously demonstrated the lowest levels of internal consistency, with an \( \alpha \) of 0.43 (McFayden et al., 2006).

Bondoc and Wall (2014) also utilized the revised RIPLS in their prospective pre and post assessment of the influence of content-based labs in neurological rehabilitation for 117 PT (n=64) and occupational therapy (n=53) students. A two factor ANOVA did not indicate statistically significant changes over time.

The remaining content-based labs used different tools in assessment of the IPE experience. Kerfield (2017) studied 69 PT (n=45) and occupational therapy (n=24) students engaging in four required sessions of interprofessional activities as part of pediatric theory and practice coursework, and utilized the Entry Level Interprofessional Questionnaire (ELIQ) in their post experience online survey of outcomes. The EILQ is a self-assessment tool containing three subscales, the Communication and Teamwork Scale, which considers communication skills, the Interprofessional Learning Scale, which
explores attitudes toward professional learning, and the Interprofessional Interaction Scale, which assesses perceptions of interactions between different disciplines (Pollard, Miers, & Gilchrist, 2004). The tool uses 4- and 5-point Likert scales, with lower scores indicating strong agreement with the provided prompt (Pollard et al., 2004). The tool has demonstrated concurrent validity with the RIPLS (r=0.84); each subscale has demonstrated good test retest reliability (r=0.78, 0.86, 0.77) and fair to good internal consistency (Chronbach’s alpha= 0.76, 0.84, 0.82) (Pollard et al., 2004). The students were surveyed on their perceptions of their IPE experiences 4 months after coursework was completed (Kerfield et al., 2017).

The survey, which was given post IPE experience, yielded a response rate of 36%. Mean score responses indicated that students demonstrated positive attitudes on the Communication and Teamwork Scale, and the Interprofessional Learning Scale. Responses to items were analyzed, and larger response variations were noted on items related to leadership and differences of opinion. Responses on the Interprofessional Interaction Scale were in the category of neutral attitudes, with a large range of responses, particularly on items concerning status, hierarchies, and communication barriers. Data was not collected in a manner to analyze students’ response by discipline (Kerfield, et al., 2017).

Del Rossi et al. (2017) selected the Interprofessional Collaborator Assessment Rubric (ICAR) as the assessment tool in their study of 79 PT (n=22), occupational therapy (n=29), and nursing (n= 28) students IPE experience of Baby Lab. In this work, the ICAR was used as a self-assessment by all students and as an observer-rating tool for a sample of the groups participating, during or after the IPE experience. The ICAR is a
competency-based tool that rates students in six dimensions, including communication, collaboration, roles, patient centered approach, team function and conflict management, on a five-point scale, ranging from not observable to mastery (Curran et al., 2011). Operational definitions of each level of proficiency are provided; in addition, each competency is comprised of two to four dimensions and sample behaviors are noted (Curran et al., 2011). The ICAR was developed as an observer-based rubric, and was validated through the use of a Delphi survey and focus groups (Curran et al., 2011). The ICAR has not been validated to date as a self-assessment tool.

Faculty and student ratings on the ICAR were compared. Using mean scores of ratings, faculty scored the sample of students assessed as “competent,” a rating of greater than or equal to 3, in all dimensions except an area of team functioning (Del Rossi et al., 2017). Students rated themselves as “competent” in all dimensions, with their lowest score falling under an aspect of collaboration.

Summary of key points from content-based lab experiences. The content-based labs were IPE experiences tied to overlapping areas of curricular content involving small numbers of disciplines. These experiences involved one to four meetings. Two of the IPE experiences used the RIPLS without noting a statistically significant change. Two studies utilized different tools, the ICAR and the ELIQ, with post experience ratings only. Generally positive attitudes were observed in all of these tools, with lower scores emerging related to status, hierarchy and conflict. The ICAR was the only competency-based observer-rating tool utilized in this review. Observers rated students as competent in all dimensions, with the exception of team functioning.
**Community-based experiences.** Just as the Del Rossi study of the Baby Lab experience (2017) engaged parents and children in pursuit of an authentic level of engagement, two of the studies reviewed utilized a multifaceted community-based IPE experience (Arenson et al., 2015; Reilly et al., 2014). Both of these IPE experiences were grounded in interactions with individuals from the community.

*Description.* Arenson et al. (2015) described the “Health Mentors Program,” a long-term IPE experience involving PT, occupational therapy, nursing, medicine, pharmacy and family therapy students, using lay persons with chronic conditions as educator mentors. Over the course of two years, small interprofessional groups met four times to complete modules based on broad topics, such as obtaining a life and health history, and assessing patient safety in the home, guided by their health mentor. Concepts of teamwork and professionalism were interwoven with the module related content. Students brought their discipline’s perspective to each topic and team interaction, as well as individual assignments, which reflected student values and learning (Arenson et al., 2015).

Reilly et al. (2014) discussed a geriatric community-based IPE experience. Students from six health professions, including PT, dentistry, medicine, occupational therapy, pharmacy, physician assistant and social work participated in the program, which met five times over the course of an academic year at a low-income senior housing unit. Students were assigned to interprofessional teams and matched with an elderly resident for the course of the experience. At each meeting, didactic content was provided by faculty, on topics salient to the geriatric population. Subsequently, the interprofessional teams assembled to plan a visit with their client, and executed these
meetings, including discipline specific assessments. Small and large group debriefs followed each client interaction (Reilly et al., 2014).

Assessment and outcomes of community-based experiences. Arenson et al. (2015) utilized the IEPS and the ATHCTS in their pretest posttest design, studying 577 students’ in six disciplines’ participation in a health mentors’ program over 2 years. In order to prevent survey fatigue, the authors split the class for assessment. Half of the students completed the IEPS, and the other half completed the ATHCTS. Paired sample t-tests were used to assess changes in students’ perceptions over time, overall, and by discipline. Statistically significant changes ($p < 0.01$) were noted on the ATHCTS for the group at large, and within each discipline over time. Adequate information was not provided to calculate effect sizes. This indicated improvements in attitudes toward IPE and collaboration in the students. No significant changes were noted on the IEPS; however, high positive pre-scores were maintained at the conclusion of the experience (Arenson et al., 2015).

Reilly et al. (2014) used the RIPLS to measure changes in attitudes of 84 PT, pharmacy, dentistry, medical, physician assistant, and social work students, after a community-based IPE experience with older adults. In this research, which utilized a pre- post design, seven students participated from each discipline, over the course of the 8-month project. A modified form of the RIPLS was utilized, where certain items were reworded so that a score of “5” reflected the most positive survey outcome. Data was analyzed using generalized equations model, using quasi- likelihood estimation. Chi square test were used to determine odds rations, given the small sample sizes within discipline. No statistically significant score changes were noted on the large group
survey, with the exception of one survey question related to roles. A few statistically significant changes were noted on one to two individual questions by individual disciplines, without pattern.

**Summary of key points from community-based experiences.** Although multiple tools were employed to assess students’ perceptions of these long-term community-based IPE experiences, statistically significant changes were noted over time for the large group, and by discipline, on only one measure, the ATHCTS, after the health mentors experience.

**Introductory IPE.** Two studies were unique in the framing of the IPE experience that was provided. Lockeman et al. (2017), and Ruebling et al., (2014) discussed the provision of IPE through an introductory IPE course offered in the first year of health professions’ programs. Both of these programs were extended to large numbers of professions and reached a high number of students. The main objectives of these courses were to provide introductory exposure and information to students about the healthcare system, professional roles, and concepts of interprofessional collaboration. The specific pedagogy related to the courses will be discussed in the next section of the review, Teaching teamwork and collaboration, in order to place it in context with the other methods of teamwork instruction uncovered in this review.

**Description.** Lockeman et al. (2017) discussed an IPE case series course offered to 679 first year students from seven professions, including PT, dentistry, dental hygiene, medicine, nursing, and pharmacy. Medicine was the largest discipline represented, with 222 students. Occupational therapy was the smallest profession represented, with 13, while 51 physical therapy students participated. This experience was required for all
professions included, with the exception of occupational therapy. The class met four times over the course of an 8-week period in classrooms equipped for team-based learning. Students were divided into consistent interprofessional groups of five to six students from at least three professions, and were supervised by faculty facilitators, who supervised five to six teams during class. Curricular focus was devoted to the areas of teams and teamwork, the healthcare system, and the roles and responsibilities of healthcare providers (Lockeman et al., 2017). Specific aspects of IPE pedagogy will be discussed in a subsequent section of this review.

Ruebling et al. (2014) studied a one credit introductory IPE course offered to first year students in 12 fields including athletic training, clinical laboratory science, cytotechnology, health information management, investigative medical sciences, nuclear medicine, nursing, nutrition, occupational therapy, PT, and radiation therapy over the course of a semester. Nursing was the largest profession represented, with 125 students, and cytotechnology was the smallest, with one. Seventy nine PT students participated. Limited detail was offered regarding the specifics of the semester long course experience. Students were placed into interprofessional teams and seated with them during the course to facilitate discussions and interprofessional learning. Teams were required to meet weekly outside of class to work on a team-based project. Curricular focus was placed on team roles and responsibilities, concepts of interprofessional collaboration, the changing healthcare system, and team development (Ruebling et al., 2014).

Assessment and outcomes of introductory IPE. Ruebling et al. (2014) used a correlational between subjects design with nonrandomized subjects and non-equivalent controls to study the influence of the introductory IPE course on student perceptions and
attitudes. Students from 12 professions, including PT, completed the questionnaire \((n=300)\), and graduating students who had not participated in IPE were used as controls \((n=200)\). The Entry Level Interprofessional Questionnaire (ELIQ) and RIPLS were used as assessment tools (Ruebling et al., 2014). Independent samples t-tests indicated significant changes over time on both the ELIQ \((p < 0.01) (d=0.20)\) and the RIPLS \((d=0.015)\) in the IPE group, with low effect sizes noted. Independent sample t-tests also noted significant differences between the IPE group and the control on the pretests and the posttests of the RIPLS \((d=0.45)\) and the ELIQ \((p<0.01) (d=0.43)\), with low effect sizes (Ruebling et al., 2014). Disaggregated data was not provided in this study.

Lockeman et al. (2017) utilized the SPICE-R2 as the measure of student perceptions of a large scale, introductory IPE case series event over time. The SPICE – R2 is a 10-item instrument that assesses perceptions of IPE using three subscales, which include interprofessional teamwork/ team-based practice, roles/ responsibilities for collaborative practice, and patient outcomes from collaborative practice. Items are rated on a 5-point Likert scale and can be totaled at the subscale and overall scale levels (Lockeman et al., 2017).

The pre-post assessment was completed at a rate of 39% (Lockeman et al., 2017). Reliability was established, with Chronbach’s alpha of 0.85 for the total measure, and 0.85 (teams and teamwork subscale), 0.76 (roles and responsibilities subscale), 0.78 (outcomes from collaborative practice). Paired samples t-tests were used to compare aggregated data over time on the overall test and at the subscale level. A small significant difference was identified on the overall scale \((d=0.17)\), but was not reflected on all subscales. This indicates improved perceptions of IPE after the experience.
Summary of key points from introductory IPE. Significant changes were noted on all the measures utilized in student self-assessment of the introductory IPE experiences, including the RIPLS, the ELIQ and SPICE-R2, with low effect sizes reported. These changes highlight improved perceived attitudes towards and readiness for IPE.

Teaching interprofessional teamwork and collaboration. IPE must teach information about and skills required for interprofessional collaboration in order to ultimately produce effective healthcare providers, a safer healthcare environment, better patient outcomes and improved patient satisfaction (Fox et al., 2018). The four competencies outlined by the Interprofessional Education Collaborative offer a roadmap toward embracing a more collaborative model of health professional education that delivers patient-centered care with interprofessional teamwork (Turkelson et al., 2018). The broad competencies of values for interprofessional practice, knowledge of roles and responsibilities, interprofessional communication skills and teamwork have been further clarified and detailed with the identification of specific sub competencies in each domain (IPEC, 2016). These sub competencies identify note specific skills and behaviors required for effective interprofessional practice (IPEC, 2016). All of the literature reviewed contained IPE experiences involving the formation of interprofessional groups, and required interaction and cooperation among students of different disciplines. However, there was significant variation on the inclusion of explicit instruction related to interprofessional competencies, or concepts of teamwork, communication, or collaborative practice in the articles reviewed.

Description. The review identified seven studies of IPE experiences containing explicit instruction related to interprofessional collaboration and teamwork (Arenson et
al., 2015; Bondoc & Wall, 2015; Garrido et al., Lockeman et al., 2017; Ruebling et al., 2014; Turkelson et al., 2018; Wellmon et al., 2012). Some of this instruction was student directed. Bondoc and Wall (2015) noted that students were provided with readings on IPE and Interprofessional Education Collaborative competencies to complete prior to the first meeting of a content-based IPE lab experience. Garrido et al. (2014) discussed the inclusion of a required online, self-paced learning module as the initial part of a multifaceted IPE simulation experience. The online module contained information related to the significance of IPE, interprofessional competencies, interprofessional roles, the impact of effective communication and teamwork in collaborative practice, and conflict resolution (Garrido et al., 2014). Following module completion, students engaged with each other in relation to this information in online discussion boards and blogs (Garrido et al., 2014). Information was not provided as to the length of this experience or time required for completion.

The remaining four studies offering an explicit component of IPE instruction utilized a lecture component of some form, combined with reinforcing interactive activities, and projects (Arenson et al., 2015; Lockeman et al., 2017; Ruebling et al., 2014; Turkelson et al., 2018). Arenson et al. (2015) provided the least specific descriptors, noting that didactic instruction was initially provided to students, then concepts of teamwork and professionalism were woven throughout the remainder of the course through interaction and group assignments (2015).

In their IPE experience, Lockeman et al. (2017) specified the use of videos for mini lectures on interprofessional concepts, such as team-based communication and situation monitoring, conflict resolution, and roles and responsibilities during each class
in their IPE case series course. These concepts were then reinforced with interactive activities involving consistent small interprofessional groups. Tasks such as formulation of a team charter facilitated application of team building ideas to each small interprofessional group. In addition, students engaged in case-based activities to facilitate application of concepts to healthcare system teams. Finally, students collaborated in the completion of a culminating project applying concepts discussed throughout the course (Lockeman et al., 2017).

Ruebling et al. (2015) described similar activities included as part of an introductory IPE course involving PT and 12 other disciplines. An unspecified amount of didactic content was related to roles, responsibilities, team development, and concepts of interprofessional care within changing healthcare system. Students also completed case-based activities while working and communicating as an interprofessional team. The students completed a team-based project over the course of the semester. In addition to their work as a team, students were required to apply information about team development their particular group in individual assignments (Ruebling et al., 2015).

Turkelson et al. (2018) provided specific and detailed information with regard to IPE instruction in their work. Rather than discussing interprofessional competencies as themes and theoretical concepts, they offered specific strategies and skills for use in interprofessional practice. PT, nursing, and doctor of nurse practitioner students were instructed in teamwork training based in crew resource management.

Crew resource management is a teamwork training strategy originally derived from the aviation industry that has been applied in the healthcare system, particularly in the acute care setting, with positive effects on teamwork and patient safety (Turkelson et
al., 2018). It targets behaviors ranging from communication, leadership, situational awareness, and decision making (Turkelson et al., 2018). Students received 4 hours of didactic instruction in specific strategies and structured communication based in crew resource management (Turkelson et al., 2018). These ranged from cues related to eye contact, tone of voice and language choice, to instruction in a specific communication algorithm derived from crew resource management. The students were also taught to use a structured team meeting checklist, to create shared mental model among team members and create shared expectations. Students had the opportunity to practice using all of the skills with paper cases initially, and later applied them in a multifaceted simulation experience emphasizing the need for communication and handoffs between healthcare providers (Turkelson et al., 2018).

**Summary of outcomes of teaching interprofessional teamwork and collaboration.**

The assessment tools and outcomes of all studies reviewed have been presented earlier in this paper. To summarize the outcomes of IPE experiences containing explicit instruction related to teamwork, Lockeman’s (2017) and Ruebling’s (2014) studies of introductory IPE experiences identified changes over time in student perceptions of IPE and readiness to engage, evidenced by statistically significant changes over time on the ELIQ, RIPLS, and SPICE-R2. Arenson’s (2015) study of a community-based health mentor’s program as an IPE experience noted significant changes over time on the ATHCTS, another attitudinally based scale.

**Methodological review.** The focus of this review was IPE experiences that employed various instructional methods, involved PT students, and utilized a previously validated, standardized assessment tool as an outcomes measure. Due to this lens, the 15
studies utilized in this review were quantitative in nature, or mixed methods. However, the scope of the review limited discussion to only the quantitative sections of mixed methods studies. All of the studies used samples of convenience, due to the fact that students were required to engage in these experiences as part of their educational curricula, and entire classes, or portions of classes were assessed.

Two of the studies used a quasi-experimental design. In addition to the convenience sample, these studies utilized a non-equivalent control group, meaning the control group was not randomly assigned (Ruebling et al., 2017; Wellmon et al., 2017). The composition of the control groups was convenient, comprised of students who had not participated in IPE experiences. The use of the control group allowed the researchers to study changes between the learning and control groups, as well as within the control and learning groups over time. These studies are also considered to be more rigorous methods of measuring the influence of the learning intervention (Creswell & Creswell, 2018). Wellmon et al.’s work identified significant changes on the majority of subscales of multiple tools, with moderate effect sizes noted. These results were some of the strongest positive changes noted in this review. Ruebling’s work noted significant changes in the subtests of different tools, with low effect sizes, which is similar to the results of other studies in this review. The remaining 13 studies used pre-experimental designs with 11 studies using pretest-posttest designs and two using post only designs.

All of the studies included in this review utilized previously validated outcome measures. The most commonly used measures were the RIPLS, the ATHCTS, and the IEPS. Figure 2.1 details the tools, their associated learning outcomes and frequency of use in this review. All are self-report measures employing the use of Likert Scales, which
measure students’ perceptions and attitudes related to their IPE experience. While all of the scales have been validated, concerns exist about some of the measures. 

Figure 2.1. Frequency of survey tools employed in this literature review, and their associated levels of learning outcomes.

The RIPLS is one of the earliest established measures created for IPE assessment, and as such, it appears frequently in the literature as an assessment tool (Mahler, Berger, & Reeves, 2015). However, as noted earlier in this review, poor internal consistency, particularly in the roles/Responsibilities subscale has been documented in the literature, with Chronbach’s alpha < 0.43 (McFayden et al., 2005). Factor analysis has revealed much variation across the literature (Mahler et al., 2015). Some have questioned the construct validity of the instrument, due to this variation, and the lack of an underlying theoretical framework during development (Mahler et al., 2015). Finally, the RIPLS was developed with the construct of readiness for interprofessional learning, as the title indicates. This implies that the measure is sound as a pre measure, but questionable when used as a post measure (Mahler et al., 2015). In the review, authors repeatedly selected the RIPLS as a pre-post measure, which calls into question the soundness of the
assessments that took place. There are other tools constructed to measure student perceptions, which demonstrate better structure, and stability (Fox et al., 2018).

Although all tools had been previously validated, some studies used the tools in other forms than originally intended, and documentation does not exist regarding tool validity in these formats. For example, Reilly et al. (2014), changed the orientation of the question wording in their study, and applied it as an assessment method, without considering the influence this change may have on the validity of the tool. In a similar way, King et al. (2016) used the ICCAS, which was designed as a retrospective pre- post assessment tool, in a prospective pre- post manner. It is unknown what the impact this different use of the tool had on the data collected. In addition, Del Rossi (2017) used the ICAR, validated as an observer scored measure, in its original format and as a student self-report measure. This second type of administration is a method that does not appear to have been previously studied. All of the tools utilized were self-assessment measures, with the exception of the ICAR, which is an observer-based tool. Reeves et al. (2016) suggest that self-assessments of perceptions are weaker measures and that tools administered by trained raters will be more robust assessments of higher-level changes in behavior and practice.

Some of the studies utilized multiple measures, and made comparisons by discipline on tools, in addition to the large group. Four studies utilized non-parametric statistics in order to analyze their data. This was likely due to the small sizes of their samples and not normative distribution of data (Adams & Lawrence, 2019). Nine studies employed parametric statistics for analysis. Paired samples t-tests were commonly used to analyze change in survey response over time. ANOVA’s were also utilized as a
measure of multiple variables. One-group post only studies generally utilized descriptive statistics to report information about measures of central tendency as the related to group scores.

Finally, while study methods aligned to their stated purpose and research questions, there appeared to be a mismatch at times between teaching and learning objective, activities, and assessment methods. For example, Turkelson et al., (2018), described in specific detail the practical strategies employed to teach students specific communication strategies appropriate for interpersonal interactions, and offered students multiple practice opportunities. However, their work reported no objective assessment of students’ communication skills and behaviors during the simulation activity they described, beyond the RIPLS, and IEPS, which have already been noted to be attitude level measures. Other self-assessments, such as the IPEC self-assessment, and the ICCAS, are self-assessments based on interprofessional competencies, and are behavior driven (Karpa et al., 2018; King et al., 2016). Or, as noted previously, a third-party rating tool, would be a better match between the levels of learning objectives and assessment methods.

**Chapter Summary**

Substantive gaps are apparent when comparing the IOM recommendations for IPE outcomes assessment (IOM, 2015), and the current state of the literature as it relates to IPE pedagogy, assessment, and outcomes, inclusive of physical therapy students and PT education programs. Physical therapist education programs are engaging in various methods of IPE instruction, creating opportunities for learning with and from students of other disciplines in short term and extended ways, and creatively integrating this
instruction into programs and curricular requirements. However, the assessment of these experiences appears to be somewhat superficial, limited to tools which consider student’s attitudes and beliefs around IPE. Rigorous evaluation of IPE activities, with the use of robust tools measuring higher level learning outcomes, such as behavior and practice change, is needed. Thoughtful consideration needs to be given to tools that are reflective measures of learning in particular environments, and are aligned with course learning objectives. The use of multiple tools may offer information regarding students’ different levels of learning (Reeves et al., 2016). The information from this research may inform schools’ choices of effective pedagogy when implementing IPE, guide accreditation standards, as well as advance scholarship in the field. This will support programs as they strive to meet accreditation standards and prepare practitioners who are equipped to effectively engage in interprofessional practice in the provision of patient centered care.

The following chapter will discuss the methodology of a quasi-experimental study designed to investigate the pedagogy and outcomes of an IPE experience.
Chapter 3: Research Design Methodology

Introduction

The accrediting bodies of health professions’ education programs expect IPE to be included in program curriculum (Del Rossi et al., 2017). The Committee on Accreditation of Physical Therapy Education (CAPTE) includes IPE as a standard of entry-level physical therapist (PT) education (CAPTE, 2020). The competencies and accreditation standards have led PT education programs to evaluate methods of IPE delivery and assess outcomes. It is necessary to understand if pedagogical methods are effective and are preparing all practitioners who are prepared to practice collaboratively. Programs must also select valid and robust assessment tools to measure learning outcomes. (Institute of Medicine [IOM], 2015; Reeves et al., 2016).

Most research on IPE assessment measures outcomes at the level of perceptions and attitudes (Reeves et al., 2016). Behavioral outcome information is necessary to determine if students are building the skills required to practice collaboratively, and to link IPE with development of collaborative behaviors (Fox et al., 2018; IOM, 2015). Gaps appear when comparing IPE assessment recommendations (IOM, 2015), and current literature on IPE pedagogy, assessment, and outcomes in pre-entry-level students.

Statement of purpose. The purpose of this study is to understand the influence of an IPE experience on the interprofessional values and behaviors of Doctor of Physical Therapy students, as compared to peers in a control group, and students of other disciplines who also participated in the IPE experience.
**Research questions.** Based on the problem that has been identified with regard to the assessment of IPE, and the purpose of this research, the following research questions have emerged:

1. What is the effect of an IPE experience on Doctor of Physical Therapy students’ interprofessional values and behaviors?

2. How do Doctor of Physical Therapy students’ interprofessional values and behaviors compare to students of other disciplines who participated in the same IPE experience?

**Research Context**

The study took place at a small private college in New York with an enrollment of approximately 3,000 students in schools of Health and Human Services, Education, Arts and Sciences, and Business and Leadership. The target population was students in the schools of Health and Human Services and Education enrolled in health sciences or education professional degree programs. A sample of convenience was utilized in this study.

**Research Participants**

Participants in the intervention group were students enrolled in an IPE experience for the fall 2019 semester. The class was comprised of students enrolled in the College’s Doctor of Physical Therapy (DPT), Bachelor of Science in Nursing, Master of Science in Speech-Language Pathology, Master of Science in Creative Arts Therapy, Master of Science in Inclusive Education, and Pre-Medical minor programs. These disciplines require student participation in the IPE course as part of their curriculum. The programs are given the flexibility to integrate the IPE experience into the curriculum in the manner
that they best see fit. As a result, students participate in the IPE experience when they are
at different points in their educational process and professional development. Table 3.1
specifies the programs included, degree conferred, level of experience, and the number of
students participating for the semester. Enrollment in the IPE course was required in
order to participate in the intervention group.

Table 3.1

*Characteristics of Programs of Study Participating in IPE Experience*

<table>
<thead>
<tr>
<th>Program</th>
<th>Degree</th>
<th>Year of Program Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Therapy</td>
<td>Doctor of Physical Therapy</td>
<td>1 of 3</td>
</tr>
<tr>
<td>Nursing</td>
<td>Bachelor of Science</td>
<td>4 of 4</td>
</tr>
<tr>
<td>Creative Arts Therapy</td>
<td>Master of Science</td>
<td>2 of 2</td>
</tr>
<tr>
<td>Education</td>
<td>Master of Science</td>
<td>1 of 2</td>
</tr>
<tr>
<td>Speech Pathology</td>
<td>Master of Science</td>
<td>1 of 2</td>
</tr>
</tbody>
</table>

The principal investigator, who was not a course instructor, introduced the
students in the intervention group to the study during the first meeting of the IPE course,
verbally invited them to participate, and provided paper copies of the survey to complete.
They were given approximately 15 minutes to complete the survey if they chose to
participate. During the last meeting of the IPE course, the principal investigator returned
to the class, and provided students the opportunity to complete the posttesting, if they
chose.
Students in the non-equivalent control group were introduced to the study in a similar manner. The principal investigator visited students in a required first year physical therapy course, and invited those not enrolled in the IPE course, who had not previously participated in IPE, to participate as controls in the study, and complete pre and posttesting. These students completed the testing in the same time frame as the intervention group.

**Instruments Used in Data Collection**

Students who agreed to participate in the study completed a demographics form in pretesting that included information about their field of study, previous interprofessional education and collaborative practice experiences (see Appendix B). Students also completed two tools selected from the National Center for Interprofessional Education Tool Measurement Collection: the Interprofessional Collaborative Competency Attainment Survey- revised (see Appendix C), and the Interprofessional IPEC Competency Self-Assessment Survey (see Appendix D).

**IPEC Competency Self-Assessment.** The IPEC Competency Self-Assessment Tool was developed as a means of ascertaining the effectiveness of educational experiences in developing the collaborative competencies needed to support interprofessional practice (Dow et al., 2014). This behavioral assessment tool is based on the theoretical framework of the IPEC Competencies, which build on the foundational work of the Canadian Interprofessional Health Collaborative, and the WHO (Dow et al., 2014). The IPEC Competencies are divided into four domains under the umbrella of interprofessional collaboration and include Values and Ethics, Roles and Responsibilities, Interprofessional Communication, and Teams and Teamwork (IPEC, 2016). Each
The IPEC Competency Self-Assessment Tool was initially composed of 42 items based on the IPEC competencies and sub competencies, with responses based on a 5-point Likert scale (Dow et al., 2014). This tool demonstrated reliability aligning with the IPEC Competency domains (Lockeman et al., 2016). However, the original study lacked confirmatory factor analysis and utilized a forced four-factor approach (Lockeman et al., 2016). The revised tool, which was utilized in this study, contains 16 items, responding to prompts initiated with the statement, “I am able to…” based on a five-point Likert scale (1= Strongly Disagree, 5= Strongly Agree) (Lockeman et al., 2016).

The revised version of the IPEC Self-Assessment was validated in a multi-institutional study which sought to confirm the tool’s factor structure, while creating a shorter, more user-friendly survey, based on evidence, equipped to examine interprofessional competency (Lockeman et al., 2016). This version contains a two-factor structure, one related to the behaviors that occur during interprofessional practice, and one related to student values about interprofessional, client-centered care (Lockeman et al., 2016). These two factors were identified as the Interprofessional Interaction domain, and the Interprofessional Values domain (Lockeman et al., 2016). Internal consistency was high for each domain (Chronbach’s $\alpha > 0.96$). Lockeman (2016) recommended that domain scores be averaged after survey completion, to arrive at two domain scores (see Appendix D for a copy of the tool).
**Interprofessional Collaborative Competency Attainment Survey.** The ICCAS is a 20-item self-report behavioral assessment tool originally developed at the University of Ottawa as a component of a Canadian initiative in IPE evaluation (MacDonald et al., 2010). The items reflect behavioral competencies that correspond to concepts from the Canadian Interprofessional Health Collaborative Competencies Framework (Schmitz et al., 2017). The original tool contains positively worded statements that respondents rate on a 7-point scale of agreement or disagreement (1= strongly disagree, 7= strongly agree) (MacDonald et al., 2010). Survey items were developed by a group of interprofessional educators and validated through a nominal group technique with a variety of content experts (MacDonald et al., 2010).

As a means of building research capacity, Schmitz et al. (2017) replicated the original psychometric study of the ICCAS, seeking data on content validity, internal structure, and relationship to other variables. The tool was studied using students enrolled in a 12-hour, one credit introductory IPE course, and modified in two ways (Schmitz et al., 2017). First, the scale was altered to a 5-point unbalanced Likert scale (1= poor, 2= fair, 3= good, 4= very good, 5= excellent) in order to better reflect student ability, reduce respondent burden, and response disposition (Schmitz et al., 2017). Next an additional 21st question was added, as a transition question, to capture change in overall ability, as a solitary measure, helpful for evaluating the concurrent validity of the ICCAS revised test items (Schmitz et al., 2017). Schmitz found moderate, positive correlations between the mean change in individual questions items and the transition question ($r= 0.37-0.53$). Also, factor analysis revealed a single factor with high internal
consistency coefficients (Chronbach’s $\alpha = 0.96$) (Schmitz et al., 2017) (see Appendix C for a copy of the ICCAS).

MacDonald (2010), Archibald (2014), and Schmitz (2017) designed and validated the ICCAS as a retrospective pre-post self-assessment. When using this type of assessment, students complete it only once, at the completion of the IPE experience. Students rate their performance twice at this time, scoring their abilities prior to the experience, as well as after. Retrospective pre-post measurement prevents some problems seen in traditional pre-post measurement, including overestimation of skill prior to intervention and response shift bias, which takes place as a result of alterations in mindset throughout the intervention (Howard, 1980; Howard, Schmeck, & Bray, 1979). This is important in the field of IPE, where students with little clinical experience lack insight into the complexities of interprofessional collaborative practice.

**Procedures for Data Collection and Analysis**

This research was structured as a quasi-experimental, pretest-posttest design with a non-equivalent control group. Campbell and Stanley (1966) coined the term “quasi experimental” for research methods that lack the ability to control and randomize subjects’ exposure to the experimental intervention. This design is suited to research where participants already exist in groups, such as an educational setting (McMillan, 2000). In this case, random assignment to groups is not possible, given the constraints of student schedules and course requirements that are beyond the principal investigator’s control. However, due to the somewhat arbitrary assignment of students to the course in the fall 2019 semester, a variety of counterfactuals can be measured and controlled. A non-equivalent control group was assembled for this study, comprised of first year
physical therapy students who were not enrolled in the IPE experience during the fall 2019 semester.

The principal investigator introduced the study to students enrolled in the IPE experience for the fall 2019 semester during the first class, invited them to participate, and provided them copies of the implied consent, demographics form, and IPEC Competency Self-Assessment. They were given an opportunity to participate in the study, or could decline to participate.

Students in the non-equivalent control group were introduced to the study in a similar manner. The principal investigator visited students in a required first year physical therapy course, invited those not enrolled in IPE to participate as controls in the study, and provided them copies of the same forms as the intervention group.

**Intervention.** The intervention for this study included the pedagogical practices executed during the IPE experience, a one-credit hybrid introductory IPE course. In this class, students were assigned to interprofessional groups of 8-10 students with a faculty facilitator from one of the participating departments. Two faculty members oversaw and coordinated the face-to-face and online course components. The course learning outcomes included:

At the completion of this course students will be able to:

1. Identify and analyze the key components of a profession and what it means to have a body of knowledge, a scope of practice, and a social contract with society.
2. Define and describe the roles and areas of expertise of various stakeholders (professionals, patients, students, families, caregivers etc.) on an interprofessional team.

3. Define and describe overlapping professional and individual values, ethics, competencies (e.g. cultural) and responsibilities of interprofessional team members.

4. Demonstrate the knowledge and skills for working within a collaborative model (e.g. cooperation, assertiveness, responsibility, communication, autonomy & coordination).

5. Assess and analyze the core components of effective interprofessional collaboration such as roles, group dynamics, and strategies for collaboration, systematic support.

6. Demonstrate the ability to engage in the process of effective interactive problem solving, conflict resolution, and ethical decision-making.

The learning objectives, teaching methods, and assignments are outlined in the curriculum documents (see Appendices E, F, and G). Highlights of the pedagogical practices included the use of case studies, exploration of professional roles and scopes of practice, interprofessional simulation, teamwork training, hot topics discussions, and evidence-based assignments.

At the conclusion of the third and final class of the IPE experience, the principal investigator returned and provided students the opportunity to complete the IPEC Self-Assessment and the ICCAS. The investigator also returned to the first year PT course to provide students in the control group the opportunity to complete the same forms.
Analysis. Descriptive statistics were utilized to describe the characteristics of the intervention and the control groups. This includes gender and discipline distribution, age means and standard deviations. Information regarding each group’s previous interprofessional practice experiences were reported, as a whole, and by discipline. Characteristics of the respondents were compared to the distribution of students at the institution.

Because the subscale scores for each assessment were normally distributed in both the intervention and control groups, a two-way mixed analysis of variance, (ANOVA) was used to measure the changes in the intervention group and the control group over time. Effect sizes were also calculated, with larger values indicating stronger effect sizes (Adams & Lawrence, 2019). A one-way independent groups analysis of variance (ANOVA) was utilized to compare the changes that occurred between each discipline in the intervention group, as more than two were present (Adams & Lawrence, 2019). The use of identical pre and posttest measures allowed for improved estimation of intervention effect in this quasi-experiment (Cook & Campbell, 1979). All statistical analysis was carried out using IBM Statistical Package for the Social Sciences (SPSS), version 25. All participant information remained anonymous, and was stored in a secure, locked cabinet in the principal investigator’s office, where it will remain for 3 years.

Summary

This research study employed a quasi-experimental pretest-posttest design with a non-equivalent control group to consider the impact of an IPE experience on the interprofessional values and behaviors of physical therapy students. Previously validated tools, based upon interprofessional competency frameworks were utilized to consider
learning outcomes on the level of values and behaviors. Quantitative statistics were used
to measure changes over time, and to compare the characteristics of students of various
disciplines. The study design and methodology intended to derive an understanding of
this IPE program’s effects. Chapter 4 discusses the data analysis process and the findings
that emerged in response to the research questions.
Chapter 4: Results

Introduction

While introductory interprofessional education (IPE) experiences are recommended as a means of building interprofessional competencies in students, there is a gap in the research related to the influence of these experiences on the student behaviors leading to interprofessional competencies. In addition, there is a lack of IPE research using validated and accepted measurement tools that are aligned to established interprofessional competency frameworks (Fox et al., 2018; Reeves et al., 2015; Reeves et al., 2016). This study compared the interprofessional values and behaviors of physical therapy students who were enrolled in an IPE course with those of peers who did not participate in the IPE experience. In addition, the interprofessional values and behaviors of all of the students of various disciplines who participated in an introductory IPE course were examined, including nursing, communication sciences, creative arts therapy, social work, education, and a premedical minor. Pre and post self-report measures were utilized to consider the influence of the IPE experience. This chapter reviews the results of this research, which were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 25.

Research Questions

There were two primary research questions posed in this study. The first considered the influence of an IPE experience on the interprofessional values and behaviors of Doctor of Physical Therapy students, whereas the second question examined
the interprofessional values and behaviors of the all of the students. Specifically, the two research questions were:

1. What is the effect of an IPE experience on Doctor of Physical Therapy students’ interprofessional values and behaviors?

2. How do Doctor of Physical Therapy students’ interprofessional values and behaviors compare to students of other disciplines who participated in the same IPE experience?

The data analysis in this chapter is organized by these research questions.

**Study Sample Descriptive Statistics**

In the intervention group, 80 students completed the pre and post surveys on interprofessional values and behaviors, out of a convenience sample of 86 students who were registered for the IPE course. This resulted in a 93% response rate. In the control group, 27 Doctor of Physical Therapy students who were not enrolled in the IPE course completed the pre and post surveys, out of a possible 27, which yielded a 100% response rate. Table 4.1 indicates the characteristics of the intervention and control groups in terms of gender, age, and major. These characteristics are reflective of the representation at the college where the study took place. Students in the study sample were primarily female and under the age of 25. One student in the sample did not provide their age, and could not be counted in the age group breakdowns.

Physical therapy students in both the intervention and control groups belonged to the same cohort, and have the same anticipated date of degree completion. This helped to ensure that they were at similar points in their education and professional development. Assignment to the groups was based on course registration, which is coordinated by
College administration, and was not due to specified factors that would impact the participants’ responses. Two students pursuing a premedical minor, who participated in the IPE course and completed the surveys, were eliminated from the data set, due to the small size of this group and the associated difficulties in drawing conclusions from their data analysis.

Table 4.1

*Demographics of Study Sample Intervention and Control Groups*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th>%</th>
<th>Control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Therapy</td>
<td>31</td>
<td>39.7</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Nursing</td>
<td>15</td>
<td>19.2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Communication Sciences</td>
<td>14</td>
<td>17.9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Creative Arts/ Music Therapy</td>
<td>10</td>
<td>12.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Education</td>
<td>8</td>
<td>10.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>19</td>
<td>24.4</td>
<td>7</td>
<td>25.9</td>
</tr>
<tr>
<td>Female</td>
<td>59</td>
<td>75.6</td>
<td>20</td>
<td>74.1</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19-24</td>
<td>56</td>
<td>71.8</td>
<td>22</td>
<td>81.5</td>
</tr>
<tr>
<td>25-29</td>
<td>13</td>
<td>16.6</td>
<td>2</td>
<td>7.4</td>
</tr>
<tr>
<td>30-34</td>
<td>5</td>
<td>6.5</td>
<td>2</td>
<td>7.4</td>
</tr>
<tr>
<td>35 and over</td>
<td>3</td>
<td>3.9</td>
<td>1</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Data Analysis: Interprofessional Values and Behaviors of Doctor of Physical Therapy Students

Two-way mixed analyses of variance (ANOVA) were utilized to determine the differences in the interprofessional values and behaviors of Doctor of Physical Therapy students in the intervention and control groups, as measured by the Interprofessional Education Collaborative (IPEC) Competency Survey and the Interprofessional Collaborative Competency Attainment Scale (ICCAS). Interprofessional Values and Interprofessional Behaviors subscale scores were calculated for the IPEC Competency Self-Assessment, to assist in this analysis. One subscale was created for the ICCAS, identifying the collaboration competency. All subscales were created and analyzed per the processes recommended in earlier validation studies of ICCAS and IPEC Competency Self-Assessment (Archibald et al., 2014; Dow et al., 2014; Lockeman et al., 2016; MacDonald et al., 2010; Schmitz et al., 2017). Post hoc analysis was also employed to analyze relationships between variables.

Assumptions of the two-way mixed ANOVA. The two-way mixed ANOVA was employed to ascertain the differences in the interprofessional values and behaviors of Doctor of Physical Therapy students who were and were not enrolled in an introductory IPE course. The ICCAS and IPEC Competency Self-Assessment were used to measure these differences. Both tools measure self-perceived interprofessional values and behaviors using a 5-point ordinal scale.

The absence of outliers in the data is an assumption required for the use of the two-way mixed ANOVA. There were no outliers on the Interaction or Values subscales of the IPEC Competency Self-Assessment, as assessed by the examination of studentized
residuals for values greater than +/- 3. One data point was identified as an outlier on the ICCAS, with a studentized residual of 3.35. This outlier was accepted, and included in the analysis of the ICCAS.

There are additional assumptions required to enable utilization of the two-way mixed ANOVA, including normal distribution of data, equality of variances of the dependent variable between the groups of the between subjects factor, and equality of covariances. Interprofessional values and behaviors were distributed normally, as assessed by normal Q-Q Plot. In addition, there was homogeneity of variances, as assessed by Levene’s test of homogeneity of variance (p > .05). Finally, there was homogeneity of covariances, as assessed by Box’s test of equality of covariance matrices ($p = .09$ ICCAS, $p = .320$ Values subscale IPEC Self-Assessment, $p = .798$ Interaction subscale IPEC Self-Assessment).

Once the assumptions were met, a two-way mixed ANOVA was conducted to investigate the impact of the IPE experience on physical therapy students’ interprofessional values and behaviors, as measured by the ICCAS, the Values subscale, and the Interaction subscale of the IPEC Competency Self-Assessment. The means and standard deviations for the pre and post scores of the control and intervention groups are listed in Table 4.2. Within-subjects effects were considered first, which are displayed in Table 4.3.

**Results: Impact of IPE on Doctor of Physical Therapy students’ ICCAS scores.** There was a statistically significant interaction between the intervention and time on the ICCAS, $F (1,56) = 9.23$, $p = .004$, partial $\eta^2 = 0.142$. This indicates that physical therapy students who participated in IPE course experienced improvements in their
interprofessional collaboration competency, whereas their classmates in the control group did not. The results demonstrate that the IPE experience influenced students’ interprofessional values and behaviors, as measured by the retrospective pre- post survey tool, the ICCAS.

**Results: Impact of IPE on Doctor of Physical Therapy students’ IPEC competency self-assessment scores, values subscale.** There was not a statistically significant interaction between the intervention and time on the Values subscale of the IPEC Competency Self-Assessment, $F (1,56) = 3.34, p = 0.073$, partial $\eta^2 = 0.056$. This indicates that physical therapy students who participated in the IPE course did not experience improvements in their interprofessional values, as compared to their classmates in the control group, as measured by the IPEC Competency Self-Assessment.

**Results: Impact of IPE on Doctor of Physical Therapy students’ IPEC competency self-assessment scores, interaction subscale.** There was a statistically significant interaction between the intervention and time on the Interaction Subscale of the IPEC Competency Self-Assessment, $F (1,56) = 5.22, p = 0.026$, partial $\eta^2 = 0.085$. This indicates that physical therapy students who participated in IPE course experienced improvements in their interprofessional interactions, whereas their classmates in the control group did not. The differential in the change in pre and post scores demonstrate that the IPE experience influenced students’ interprofessional behaviors, as measured by this subscale of the IPEC Self-Assessment.

**Results: simple main effect of group.** Simple main effects were analyzed on the statistically significant results to examine the effects of one independent variable at different levels of the second independent variable. When considering the simple main
effect for group, there was not a statistically significant difference between groups on the pretest scores of the Interaction subscale of the IPEC Self-Assessment, $F (1,56) = 1.09, p = .302$, partial $\eta^2 = .019$. However, there was a difference in posttest scores between interventions, $F (1,56) = 29.59, p < .001$, partial $\eta^2 = .346$. This indicates that the intervention and control groups’ perceptions of interprofessional interactions were at the same level at the beginning of the study, but at different levels at the end of the study.

The simple main effect for group analysis also indicated that there were statistically significant differences in the ICCAS pretest scores between interventions, $F (1,56) = 0.72, p = .03$, partial $\eta^2 = .148$. There were also statistically significant differences in the ICCAS posttest scores between interventions, $F (1, 56) = 32.44, p < .001$, partial $\eta^2 = .367$. This analysis specifies that the level of collaboration competency measured by the ICCAS was different between the control and intervention groups at the start and the completion of the research.

**Results: simple main effect of time.** When considering the simple main effect for time, there was not a statistically significant effect of time on the Interaction subscale of the IPEC Self-Assessment for the control group, $F (1, 26) = 1.184, p = .286$. However, there was a statistically significant effect of time on the Interaction Subscale for the intervention group, $F (1, 30) = 19.48, p < .001$, partial $\eta^2 = .394$. This demonstrates that over time, the intervention group grew in its report of interprofessional behaviors on the IPEC Self-Assessment, while the control group did not.

There was a statistically significant effect of time on the ICCAS for the control group, $F (1, 26) = 42.67, p < .001$, partial $\eta^2 = .621$, as well as the intervention group, $F (1, 30) = 125.45, p < .001$, partial $\eta^2 = .807$. These results indicate that both the control
and interventions groups changed improved significantly on their perceived interprofessional collaboration, as reported on the ICCAS.

**Results: main effects.** Main effects were calculated for the Values subscale of the IPEC Competency Self-Assessment, since a significant interaction effect did not exist during the initial analysis. The main effect of time did not reveal a statistically significant difference in the mean scores of the Values subscale of the IPEC Competency Self-Assessment at the different time points, $F(1, 56) = 0.616, p = .436$, partial $\eta^2 = .011$. However, the main effect of group demonstrated there was a statistically significant difference in the mean scores of Values subscale of the IPEC Competency Self-Assessment between the intervention and control groups, $F(1, 56) = 7.24, p = .009$, partial $\eta^2 = 0.114$.

**Data Analysis; Interprofessional Values and Behaviors of Students Who Participated in IPE**

A one-way analysis of variance was employed to determine the differences in the interprofessional values and behaviors of students of various majors who participated in an Interprofessional Education (IPE) experience. The Interprofessional Education Collaborative (IPEC) Competency Survey and the Interprofessional Collaborative Competencies Attainment Scale (ICCAS) were used as a means of measuring interprofessional values and behaviors. Interprofessional Values and Interprofessional Behaviors subscale scores were calculated for the IPEC Competency Self-Assessment, to assist in this analysis. One subscale was created for the ICCAS, identifying the collaboration competency.
Table 4.2

Means and Standard Deviations for Intervention and Control Groups and Three Dependent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Interaction Subscale of IPEC Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest Score</td>
<td>3.92</td>
<td>0.60</td>
</tr>
<tr>
<td>Posttest Score</td>
<td>4.48</td>
<td>0.41</td>
</tr>
<tr>
<td>Values Subscale of IPEC Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest Score</td>
<td>4.52</td>
<td>0.44</td>
</tr>
<tr>
<td>Posttest</td>
<td>4.70</td>
<td>0.33</td>
</tr>
<tr>
<td>ICCAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>3.24</td>
<td>0.53</td>
</tr>
<tr>
<td>Posttest</td>
<td>4.20</td>
<td>0.43</td>
</tr>
</tbody>
</table>

All subscales were created and analyzed per the processes recommended in earlier validation studies of ICCAS and IPEC Competency Self-Assessment (Archibald et al., 2014; Dow et al., 2014; Lockeman et al., 2016; MacDonald et al., 2010; Schmitz et al., 2017). The pretest subscale scores were analyzed to understand if there were differences in interprofessional values and behaviors of students of different majors at the onset of the IPE experience. Similarly, posttest subscale scores were reviewed to determine differences by major at the conclusion of the course. Change scores were then created to quantify the differences in the amount of growth throughout the course. Post hoc analysis was also employed to analyze relationships between variables.
Table 4.3

Two Way Analysis of Variance for the Effects of Interprofessional Education on Interprofessional Values and Behaviors of Doctor of Physical Therapy Students

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction Subscale of IPEC Competency Self-Assessment</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>3.62</td>
<td>3.62</td>
<td>14.77</td>
<td>&lt;.001</td>
<td>.21</td>
</tr>
<tr>
<td>Time x Group</td>
<td>1.28</td>
<td>1.28</td>
<td>5.22</td>
<td>.03</td>
<td>.09</td>
</tr>
<tr>
<td>Error</td>
<td>13.71</td>
<td>0.25</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Values Subscale of the IPEC Competency Self-Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>0.09</td>
<td>0.09</td>
<td>0.62</td>
<td>.44</td>
<td>.01</td>
</tr>
<tr>
<td>Time x Group</td>
<td>0.49</td>
<td>0.49</td>
<td>3.34</td>
<td>.07</td>
<td>.06</td>
</tr>
<tr>
<td>Error</td>
<td>8.14</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICCAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>17.46</td>
<td>17.46</td>
<td>154.85</td>
<td>&lt;.001</td>
<td>.73</td>
</tr>
<tr>
<td>Time x Group</td>
<td>1.04</td>
<td>1.04</td>
<td>9.23</td>
<td>.004</td>
<td>.14</td>
</tr>
<tr>
<td>Error</td>
<td>6.32</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All subscales were created and analyzed per the processes recommended in earlier validation studies of ICCAS and IPEC Competency Self-Assessment (Archibald et al., 2014; Dow et al., 2014; Lockeman et al., 2016; MacDonald et al., 2010; Schmitz et al., 2017). The pretest subscale scores were analyzed to understand if there were differences in interprofessional values and behaviors of students of different majors at the onset of the IPE experience. Similarly, posttest subscale scores were reviewed to determine differences by major at the conclusion of the course. Change scores were then created to quantify the differences in the amount of growth throughout the course. Post hoc analysis was also employed to analyze relationships between variables.
Results: differences in interprofessional values and behaviors pretest scores by major. The one-way ANOVA was selected to consider the differences in the interprofessional values and behaviors of students of various majors enrolled in the IPE experience. Pretest scores on the Values and Interaction subscales of the IPEC Self-Assessment, and the ICCAS were reviewed by major, for outliers, normality and homogeneity of variances. This procedure was undertaken to ensure that each of these important assumptions of the one-way ANOVA was met.

There were no outliers identified on the pretest scores of the Values or Interaction subscales of the IPEC Self-Assessment, or the ICCAS, when assessed by examination of studentized residuals for values greater than +/- 3. Normality was evaluated by use of the Shapiro-Wilk test \( p > .05 \) and assessment of normal Q-Q plots and scatterplots. The pretest scores on the Interaction Subscale of the IPEC Self-Assessment and the ICCAS were normally distributed by major, based on these criteria. The scores on the Values subscale of the IPEC Self-Assessment were approximately normally distributed, when viewed on the normal Q-Q plots and scatterplots, but did not meet the criteria of the Shapiro-Wilk test \( p = .001 \). The decision was made to retain all of the data points and to proceed with analysis. All three subscales demonstrated homogeneity of variance, as measured with Levene’s test \( p > .05 \).

Pretest scores on the ICCAS were statistically significantly different between majors, \( F (4, 73) = 4.84, p < .05, \omega^2 = 0.25 \). Mean pretest scores on the ICCAS increased among the majors from communication sciences (2.99 +/- 0.51) to physical therapy (3.23 +/- 0.53) to education (3.52 +/- 0.67) to creative arts/music therapy (3.59 +/- 0.65) to nursing (3.78 +/- 0.46), in that order. Tukey’s post hoc analysis revealed that the
differences between communication sciences and nursing majors’ pretest scores (0.79, 95% CI 0.22 to 1.35) were significant ($p = .002$). In addition, post hoc analysis demonstrated that the differences between physical therapy majors’ and nursing students’ pretest ICCAS scores (0.54, 95% CI 0.06 to 1.02) were significant ($p = .02$). Pretest scores on the Values and Interaction subscales of the IPEC Competency Self-Assessment were not statistically significantly different among the various majors participating in the IPE experiences. Means and standard deviations of all pretest scores are reported, broken down by major, in Table 4.4.

Results: differences in interprofessional values and behaviors posttest scores by major. The one-way ANOVA was also employed to understand the differences in interprofessional values and behaviors of students at the conclusion of the IPE experience. Posttest scores on the ICCAS, as well as the Values and Interactions subscales of the IPEC Competency Self-Assessment were examined for outliers, normality, and homogeneity of variances, in order to fulfill the assumptions of the one-way ANOVA.

The studentized residuals of the posttest means of the ICCAS, the Values subscale and the Interaction subscale of the IPEC Competency Self-Assessment were reviewed, by major, to determine the presence of outliers. No residual values greater than +/- 3 were identified on the Values or Interactions subscales of the IPEC Self-Assessment, confirming a lack of outliers in this data. One outlier was identified on the ICCAS, with a studentized residual value of 3.79. Statistical analysis proceeded with this value included in the data set.
Normality of this posttest data was assessed using the Shapiro-Wilks Test, and examination of normal Q-Q plots and scatterplots. While the normal Q-Q plots and scatterplots for each subscale approximated normality, all of the subscales presented with a Shapiro-Wilks test p value < .05. Despite this, data analysis continued with the inclusion of all data points. Finally, each of the subscales demonstrated homogeneity of variances as assessed by Levene’s test, with p values >.05 for the Values subscale of the IPEC Self-Assessment (p =.86), the Interaction subscale of the IPEC Self-Assessment (p =.32), and the ICCAS (p =.47).

The results of the one-way ANOVA indicated that there were no statistically significant differences by major in the posttest scores on the ICCAS, and the Interactions and Values subscales of the IPEC Competency Self-Assessment.

**Results: comparison of the changes in interprofessional values and behaviors in students of various majors participating in IPE.** The one-way ANOVA was also selected to consider the differences in the changes in interprofessional values and behaviors of students of various majors after an IPE experience. Student change scores on each of the three subscales were reviewed, by major, for outliers, normality and equality of variances. This procedure was undertaken in order to be sure that each of these important assumptions of the one-way ANOVA was met.

There were no outliers identified on the change scores of the IPEC Values and Interactions subscales when assessed by examination of studentized residuals for values greater than +/- 3. There was one outlier greater than 3 noted on the ICCAS during assessment of the studentized residual change scores. This data point was accepted, included in the data set, and data analysis proceeded.
During examination for normality, the distribution of scores by major on the Values subscale of the IPEC Self-Assessment and the ICCAS were approximately normal. Studentized residual values of the change scores of these subscales were assessed using the Shapiro Wilk test ($p > .05$), as well as inspection of normal Q-Q plots and scatterplots. The residuals of the IPEC Interaction subscale change scores were the same, with the exception of the Shapiro Wilk test results ($p = .024$). Despite this value, the decision was made to proceed with the analysis, given that the other results approximated normality. There was homogeneity of variances noted for the IPEC Self-Assessment Values subscale ($p = .65$), Interaction subscale ($p = .47$), and the ICCAS ($p = .13$), as assessed using Levene’s test for equality of variances.

Changes in the interprofessional values and behaviors of students who participated in IPE varied by major, as measured by the Values subscale of the IPEC Self-Assessment, the Interaction Subscale of the IPEC Self-Assessment, and the ICCAS. Table 4.4 provides a description of the means and standard deviations of the change scores of each scale by student major. Although the amount and range of change in the scores varied by major, the differences in these groups were not statistically significant. Table 4.5 details the results of the comparisons made between and within groups.

**Conclusion**

This study’s sample consisted of an intervention group of 78 students, including 31 studying physical therapy, 15 nursing students, 14 communication sciences disorders students, 10 creative arts/ music therapy and eight education students who participated in an introductory IPE course.
Table 4.4

Means and Standard Deviations for the Values Subscale of the IPEC Self-Assessment, Interaction Subscale of the IPEC Self-Assessment, and ICCAS Scores of Students from Five Majors who Participated in an IPE Experience

<table>
<thead>
<tr>
<th>Variable</th>
<th>Physical Therapy</th>
<th>Nursing</th>
<th>Communication Sciences</th>
<th>Creative Arts/ Music</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>IPEC Values Pretest</td>
<td>4.51</td>
<td>0.44</td>
<td>4.39</td>
<td>0.46</td>
<td>4.48</td>
</tr>
<tr>
<td>IPEC Interaction Pretest</td>
<td>3.91</td>
<td>0.60</td>
<td>3.74</td>
<td>0.62</td>
<td>3.80</td>
</tr>
<tr>
<td>ICCAS Pretest</td>
<td>3.24</td>
<td>0.53</td>
<td>3.78</td>
<td>0.46</td>
<td>2.99</td>
</tr>
<tr>
<td>IPEC Values Posttest</td>
<td>4.70</td>
<td>0.33</td>
<td>4.80</td>
<td>0.26</td>
<td>4.52</td>
</tr>
<tr>
<td>IPEC Interaction Posttest</td>
<td>4.48</td>
<td>0.41</td>
<td>4.63</td>
<td>0.35</td>
<td>4.32</td>
</tr>
<tr>
<td>ICCAS Posttest</td>
<td>4.20</td>
<td>0.43</td>
<td>4.48</td>
<td>0.42</td>
<td>4.11</td>
</tr>
<tr>
<td>IPEC Values Change</td>
<td>0.19</td>
<td>0.53</td>
<td>0.42</td>
<td>0.49</td>
<td>0.04</td>
</tr>
<tr>
<td>IPEC Interaction Change</td>
<td>0.56</td>
<td>0.71</td>
<td>0.88</td>
<td>0.65</td>
<td>0.52</td>
</tr>
<tr>
<td>ICCAS Change</td>
<td>0.97</td>
<td>0.48</td>
<td>0.70</td>
<td>0.61</td>
<td>1.12</td>
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Table 4.5

One Way Analysis of Variance for the Effects of Major on Three Dependent Variables Measuring a Change in Interprofessional Values and Behaviors after an IPE Experience

<table>
<thead>
<tr>
<th>Variable and source</th>
<th>SS</th>
<th>MS</th>
<th>F (4, 73)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPEC Values Subscale Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>1.30</td>
<td>0.33</td>
<td>1.27</td>
<td>0.29</td>
</tr>
<tr>
<td>Within</td>
<td>18.67</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPEC Interaction Subscale Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>2.57</td>
<td>0.64</td>
<td>1.48</td>
<td>0.22</td>
</tr>
<tr>
<td>Within</td>
<td>31.65</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICCAS Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between</td>
<td>1.98</td>
<td>0.50</td>
<td>1.63</td>
<td>0.18</td>
</tr>
<tr>
<td>Within</td>
<td>22.21</td>
<td>0.30</td>
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</tbody>
</table>

It also consisted of a control group of 27 physical therapy students who did not participate in the IPE course, but were members of the same cohort as those students who did. Both the intervention and control groups were approximately 75% female and primarily under 25, which reflects the proportions of these populations at the college where the study took place. In order to address the first research question, participation in the intervention or control group served as the independent variable, whereas enrollment in a particular major served as the independent variable to consider the second research question. The dependent variables in both cases were students’ self-perceived interprofessional values and behaviors, as measured by the IPEC Competency Self-Assessment and the ICCAS. Parametric analysis was employed to consider the research questions, based upon the ordinal and categorical characteristics of the sample data.
A two-way mixed ANOVA was utilized to analyze the differences in the interprofessional values and behaviors of Doctor of Physical Therapy students who participated in IPE in comparison to those who did not. Significant differences were identified over time between the intervention and control groups on the ICCAS and the Interactions subscale of the IPEC Competency Self-Assessment. No significant differences existed between groups at any time on the Values subscale of the IPEC Self-Assessment.

A one-way ANOVA was used to compare the pretest scores, posttest scores and overall change in scores of students from five different majors who participated in an IPE experience. Physical therapy students, and communication sciences majors demonstrated statistically significantly different pretest scores than nursing students on the ICCAS, but no differences in pretest scores on the Values or Interactions Subscales of the IPEC Competency Self-Assessment. Students from all of the participating majors exhibited no statistically significant differences from each other on both their posttest scores and their change scores on the ICCAS, the Values subscale of the IPEC Self-Assessment and the Interaction subscale of the IPEC Self-Assessment. Chapter 5 integrates and orients these findings with regard to the IPE literature. Implications for educators, suggestions for future research, and study limitations will also be presented.
Chapter 5: Discussion

Introduction

Professional associations and accrediting bodies, including the American Physical Therapy Association and the Committee on Accreditation of Physical Therapy Education, have promoted the integration of interprofessional education (IPE) into the educational preparation of healthcare providers (Arth et al., 2018; Del Rossi et al., 2017). The intent of IPE experiences is to build interprofessional competencies, which align with the Core Competencies for Interprofessional Practice (IPEC, 2016). In addition to providing IPE, institutions and programs must engage in assessment to understand if it is achieving the desired goals. The Institute of Medicine (IOM) created the Interprofessional Learning Continuum (IPLC) Model for use in healthcare education to guide IPE Assessment (IOM, 2015). It delineates the developmental nature of IPE, and identifies a spectrum of learning outcomes, which range from changes in reaction, at the low end, to changes in behavior and practice, at the high end (IOM, 2015). In association with the development of this model, the IOM also called for the need to strengthen the IPE evidence base, and better link IPE to improvements in collaborative behaviors among students of healthcare professions (IOM, 2015). With the establishment of interprofessional competencies, the learning model, assessment goals and accreditation standards, higher education institutions, and particular disciplines, such as physical therapy, (PT) are equipped to implement IPE experiences and begin to evaluate their efficacy and outcomes.
**Review of Methodology**

This quantitative study took place at a small private college in New York with an enrollment of approximately 3,000 students. The target population was students in the schools of Health and Human Services and Education enrolled in health sciences or education professional degree programs. A sample of convenience was utilized for the intervention group, composed of students from physical therapy, communication sciences, nursing, creative arts therapy, and education programs enrolled in an introductory IPE course during the fall 2019 semester. Similarly, the control group included physical therapy students from the same cohort as the intervention group, who were not enrolled in the IPE course in the fall semester, and had not previously completed it. The age and gender distribution of the sample for the intervention ($n=78$) and control groups ($n=27$) were reflective of the institution’s total student population.

This research compared the self-perceived interprofessional values and behaviors of physical therapy students who participated in an introductory IPE course to those who did not. It also explored the differences in interprofessional values and behaviors among students of different majors who completed the IPE experience. Interprofessional values and behaviors were collected using paper-based surveys with two self-assessment tools, the Interprofessional Education Collaborative (IPEC) Self-Assessment and the Interprofessional Collaborative Competency Attainment Scale (ICCAS), in a pretest, posttest format.

Both of these tools have been previously validated and utilized with students who have engaged in IPE experiences (Archibald et al., 2014; Dow et al., 2014; Lockeman et al., 2016; MacDonald et al., 2010; Schmitz et al., 2017). The IPEC Competency Self-
Assessment is a traditionally formatted survey. It contains a two-factor structure, the Interaction domain and the Values domain (Lockeman et al., 2016). Responses to items corresponding to each domain were averaged to arrive at a subscale score, referred to as the Interaction subscale, or the Values subscale (Lockeman et al., 2016).

The ICCAS is a retrospective pre-post self-assessment with a one-factor structure, the collaboration competency. Item responses were averaged to obtain an ICCAS score (Archibald et al., 2014; Schmitz et al., 2017). Students completed the ICCAS once, during the posttest period, and retrospectively identified perceptions of their pretest and posttest skills.

The ICCAS was intentionally formulated as a retrospective pre-post survey (MacDonald et al., 2010; Archibald et al., 2014). This was done in an effort to facilitate self-reflection on the part of students, understanding that at the onset of an IPE experience, students may not have a grasp on the nuances of collaboration that is required for IPC (MacDonald et al., 2010). The retrospective pre-post format provides this opportunity and combats students’ tendencies to overrate themselves on a topic for which they may lack full comprehension. Student understanding of the construct being measured may advance, and this type of survey addresses the associated response shift bias (Archibald et al., 2014). Because the validity of retrospective pre-post surveys has been previously supported, (Howard et al., 1979; Howard, 1980; Sibthorp et al., 2007), this tool is an effective means of understanding IPE’s impact on building competency, but from another vantage point.

This study was structured as a quasi-experimental pretest posttest design with a non-equivalent control group. Due to the nature of the sample, and the research
questions, parametric statistics were employed. A two-way mixed analysis of variance (ANOVA) was utilized to compare the interprofessional values and behaviors of physical therapy students who participated in an IPE experience to those who did not. Simple main effects were analyzed on the survey subscales that demonstrated statistically significant results, and main effects were analyzed on the subscales that did not. A one-way ANOVA was used to compare the interprofessional values and behaviors of students who participated in the interprofessional education experience. Post hoc testing was executed on statistically significant results.

Summary of Results

The first research question considered the interprofessional values and behaviors of physical therapy students who participated in an IPE experience in comparison to those of their peers who did not. Physical therapy students in the intervention group demonstrated statistically significant improvements over the duration of the intervention, as measured by the Interaction subscale of the IPEC Self-Assessment, and the ICCAS. Simple main effect analysis highlighted the impact of group assignment and time on these subscale scores. There was no significant difference in the scores of the Values subscale of the IPEC Self-Assessment by group over time.

The second research question considered the interprofessional values and behaviors of students of different disciplines who participated in IPE, in regard to one another. Analysis revealed that there were no significant differences in the change in interprofessional values and behaviors of students of different majors over time, as measured by either of the self-assessments. There was a significant difference in the pretest levels of interprofessional values and behaviors of nursing students, when
compared to physical therapy and communication sciences students, as measured by the ICCAS. There were no other significant differences in the pretest, posttest or subscale change scores among students who participated in IPE.

**Implications of Findings**

This section interprets the findings of this research study and places them in the context of the current literature on IPE. It also presents several implications of the research findings as they relate to teaching and learning in IPE.

The structure of this study responds to the needs that have been identified regarding ways to effectively engage in the study of IPE. These include robust study designs formed with a strong purpose of evaluation, and a clear understanding of the outcome that is to be assessed. In addition, measurement tools must be selected, with the preference being previously validated surveys that correspond to established interprofessional competency frameworks, or the ability to triangulate data (Fox et al., 2018; IOM, 2015; Reeves et al., 2015, 2016).

Although the randomized trial is the gold standard, (Fox et al. 2018, Reeves et al., 2015), this study’s quasi-experimental pretest posttest design with a non-equivalent control group allows measurement of change that controls for differences between groups (Reeves et al., 2015). The inclusion of time and group data points in this research allows for clearer understanding of the intervention’s effect on a group of students. The strong methodology and purposeful selection of survey tools in this study allow for a conclusion that extends the findings of other IPE research, into the domain of behaviors.

The findings that emerged from this IPE experience via the use of the IPEC Competency Self-Assessment and the ICCAS are somewhat unique within the literature.
This is due to the choice of these assessments as measurement tools. In the literature reviewed, these particular assessments were used less frequently than other measures that assess self-perceived values and attitudes towards IPE, such as the Readiness for Interprofessional Learning Scale, (RIPLS) Interdisciplinary Education Perception Scale (IEPS), and Attitudes Toward Health Care Teams Scale (ATHCTS). The limited availability of studies employing the ICCAS and the IPEC Self-Assessment highlights the previously identified need to utilize assessment methods that move our collective understanding of IPE’s impact to higher levels. Ultimately, a greater range and depth of meaningful information regarding IPE outcomes will allow educators and administrators to better allocate resources, as well as thoughtfully select learning interventions that effectively move students to a new level of competence.

The influence of IPE on the interprofessional values and behaviors of Doctor of Physical Therapy students. Significant differences were noted between physical therapy students in the intervention and control groups on both the ICCAS and the Interaction Subscale of the IPEC Competency Self-Assessment. This finding reinforces the efficacy of the intervention as a means of growing self-perceived interprofessional competency. Growth in the intervention group was noted on both survey tools as a result of the intervention, which substantiates the findings. In addition, the connections between interactions and behaviors as a means of competency building emerge from these results.

Since physical therapy students in the intervention group experienced improvements in self-perceived interprofessional behaviors that their peers in the control group did not, it is reasonable to look to the content of the IPE experience to obtain a
better understanding of which processes changed students’ perceptions. This may help to explain the results found in this study and support the development of an understanding of the components of an effective IPE experience.

The influence of teaching and learning methods within an IPE experience.

This course was a multifaceted experience, with a variety of learning methods utilized to facilitate the growth of interprofessional competencies. The instruction in this course was delivered via a hybrid model, with three face-to-face sessions, and asynchronous activities that were facilitated through the College’s learning management system over the duration of the course. Students worked and learned together in small interprofessional groups, or communities of practice, facilitated by faculty members from different disciplines.

The IPE course placed an emphasis on understanding the roles and responsibilities of healthcare providers, concepts of teamwork, and interprofessional collaboration through the use of readings and videos. Students were also provided with the opportunity to practice skills though interactive learning experiences, including interprofessional interviews, case studies, and simulations. The instruction was intentional, and IPEC’s Core Competencies for Interprofessional Practice framework drove the learning objectives. Curricular design supported the thinking that IPE should provide instruction on the skills required for interprofessional collaboration, in order to prepare effective healthcare workers and support the Triple Aim of healthcare (Fox et al., 2018). Assessment tools were aligned to course learning objectives, and course activities to the IPLC model (see Appendices F and G).
As part of this IPE experience, students completed two simulation experiences, employing standardized patients. In the medical simulation, students dealt with a patient with a traumatic brain injury and orthopedic injuries, based in the acute care setting. The setting of an acute care environment is consistent with other reviewed simulation studies. The second simulation in this IPE course was unique, due to the fact it was grounded in the educational setting in the context of a special education interprofessional meeting.

This IPE course included students pursuing graduate degrees in education, in addition to nursing and other allied health professions. Although the core components of interprofessional competency are the same, regardless of the practice environment, the circumstances of the medical and educational simulations allowed students the opportunity to practice interprofessional behaviors in response to patient, student, or family needs in different settings. The adaptation of the simulation intervention based on the backgrounds of the learners participating, and the future context of their IPC supports previous work (Lockeman et al., 2017). It also speaks to the importance of tailoring IPE experiences to the needs of students, whether it is based on their developmental level, domain of skills, or future practice environment.

The growth of interprofessional behaviors in the intervention group aligns with the literature regarding the influence of simulations in building interprofessional competency. Others have identified simulation as an effective means of growing interprofessional readiness, attitudes and values in Doctor of Physical Therapy students, both as a multifaceted (Garrido et al., 2014; Turkelson et al., 2018) learning experience, and as a singular event (Karpa et al., 2018; Lefebvre et al., 2015; Rossler & Kimble, 2016; Wellmon et al., 2017). The findings of this study, including intervention group
improvements on the ICCAS, and the Interactions Subscale of the IPEC Competency Self-Assessment, extend the thinking regarding the positive role of simulation into the domain of behavior.

**Aligning IPE learning objectives, activities, assessment, and outcomes.** Because of the structure of the study, it is difficult to ascertain exactly which course activities were the most meaningful as far as changing students’ perceptions of their behaviors. However, when looking at the alignment of the course learning objectives, instruction, and the subscale survey items that demonstrated significant improvement in the intervention group, some interesting connections emerged. Items on the Interactions Subscale of the IPEC Competency Self-Assessment most specifically corresponded to the IPE course’s higher-level learning objectives. These included demonstrating knowledge and skills for a collaborative model, analyzing the components of effective interpersonal collaboration, and demonstrating problem solving, conflict resolution and effective decision-making (see Appendix F). The course activities that most directly connect to those learning objectives include the interprofessional case study, videos on communication, collaboration, teamwork readings, and the simulations (see Appendix G). Because of this alignment, it is reasonable to conclude that these particular experiences may have been impactful in moving students forward in their interprofessional development. The readings and videos on communication, collaboration, and teamwork were a good source of practical knowledge on strategies. The interactive case study experience and the two simulations provided students a chance to practice skills, engage in behaviors, and begin to navigate within their small interprofessional team, working toward common goals. Perhaps these activities built
upon one another in such a way that they culminated in the modest short-term improvements seen in students’ perceived interprofessional behaviors.

Although the enrollment in this class was smaller and not limited to first-year students, this course contains curricular components that correspond to the introductory IPE experiences referenced in Lockeman (2017) and Ruebling’s work (2014). The structure of the course in Lockeman’s (2017) work was most similar to the course studied here. However, their results varied, in that their study did not identify changes in attitudes toward teamwork in the first-year students studied. Their findings were in contrast to this study, in which significant improvements in interprofessional interactions were noted, but not values.

It is unclear why physical therapy students, who were relatively early in their professional education, changed significantly in higher level learning outcomes related to interprofessional behaviors, as opposed to interprofessional values, after this IPE experience. Seventy percent of the PT students in the intervention group, and 93% of students in the control group reported no or infrequent history of participation in interprofessional collaborative practice at the beginning of the study.

Perhaps all of the first-year physical therapy students had enough interprofessional socialization to hold IPE and IPC in high regard, and to demonstrate a positive attitude toward these concepts. Prior to their first year of PT school, students were required to complete at least 40 hours of observation in two or more practice settings. During these experiences, they may have been exposed to physical therapists engaging in IPC as part of a healthcare team. In addition, prior to the IPE course, students completed a course in professional development, which introduced them to the
profession of physical therapy, various practice settings, and the roles of therapists in those settings. This was another opportunity for student exposure to the team-based care that is often provided in rehabilitation. In addition to building exposure to their professional identity as physical therapists, these experiences may also have contributed to their interprofessional socialization.

It is possible that these past exposures to the profession of physical therapy, and the role of the PT on the healthcare team is reflected in the pretest scores of the Values subscale of the IPEC Self-Assessment in the intervention and control groups. The average pretest scores for this subscale were the highest of all three subscales, with the intervention group reporting scores of 4.5 out of 5, and the control group, 4.4 out of 5. These high scores left relatively little room for improvement. From a developmental perspective, it is logical that students who exhibited proficiency on a lower-level outcome, such as values, would go on to demonstrate growth in higher domains of learning, such as skills and behaviors.

The interprofessional values data points contrast with the intervention and control groups’ pretest scores on the Interaction subscale of the IPEC Self-Assessment, which were noted to be 3.9 and 3.7, indicating a lower level of self-perceived competence in interprofessional interactions. Likewise, intervention and control groups’ retrospectively assessed pretest scores on the ICCAS were even lower, with values of 3.2, and 2.75, respectively. The differences in the values, interactions, and collaboration competency subscales support the perspective that the development of interprofessional competence is a continuum, with different levels of learning emerging at various stages. Initially, the physical therapy students in this study were at a point where they possessed higher levels
of self-perceived interprofessional values, relative to their interprofessional behaviors, or interprofessional collaboration competence.

This IPE experience did not improve the self-perceived interprofessional values of Doctor of Physical Therapy students. Instead, it appeared to expose students to the skills required to engage in what they already perceived as a valuable practice. This aligns somewhat with the emphasized areas of course content. While the IPE course was introduced via topics such as, “Why IPE/ IPC,” which were intended to promote the value of interprofessional work, substantiated by factual information, more time was spent learning about roles and responsibilities, and in real time interactions with others. These experiences offered the students chances to practice communication, problem solving, and teamwork skills. While these were not true patient care experiences, they were authentic in the scenarios and the problems that the interprofessional teams faced, and the strategies that were required to successfully achieve the desired goals. In the short term, PT students in the intervention group identified gains in their abilities, after the IPE experiences that their peers did not.

**The interprofessional values and behaviors of students who participated in IPE.** In addition to comparing the interprofessional values and behaviors of physical therapy students within intervention and control groups, it is worthwhile to examine data from all of the students who participated in the IPE experience. A review of the pretest, posttest and change scores of these students provides an opportunity to understand the meaning of this IPE experience in students’ interprofessional development, relative to one another. It allows consideration of IPE’s influence on students of different
backgrounds and disciplines, which can inform course planning, curriculum development, and IPE placement within programs.

**Students who participate in IPE may begin in different places.** Within the intervention group, it was noted that students in different majors had significantly different ICCAS pretest scores. Specifically, nursing students’ average initial ratings of 3.8 out of 5, were significantly higher than students studying physical therapy and communication sciences, who demonstrated initial scores of 3.0 and 3.2. This finding is interesting due to the placement of the IPE course in each of these programs’ curricula, and due to the use of a retrospective pre-post assessment, the ICCAS, that identified these differences. The nursing students completed this IPE experience in the final semester of their degree preparation, just prior to graduation. As students, they entered the course with a high level of professional competence, and as reflected by the ICCAS, a higher level of interprofessional collaboration competence. It could be inferred that these students have already built a higher level of interprofessional competence as a result of didactic, lab, and clinical placement experiences that have taken place in their program. In clinical placements in particular, nursing students likely had real world opportunities to engage in on the job IPE and practice IPC in their role as part of the healthcare team. This reasoning is substantiated by reports of 66% of the nursing students that they engaged in IPC occasionally to frequently. It is logical that their reflection on their initial levels of competence would yield higher results.

The perceptions of the nursing students differed from those of the physical therapy and communication sciences students who participated in the IPE course during the first year of their professional programs. Communication sciences and physical
therapy students reported much lower levels of occasional to frequent IPC experience, at 29% and 21%, respectively. These students are at a much earlier stage of development with regard to their professional and interprofessional competencies. They have had more limited exposure to concepts of interprofessional collaboration via classroom, lab, or clinical experiences, relative to students of other disciplines. Physical therapy and communication sciences students are still building foundational skills for their specific disciplines, and for their interprofessional identities as well.

The differences in the pretest scores of physical therapy, communication sciences, and nursing students were identified through the use of the ICCAS, a retrospective pre-post assessment. This intriguing finding supports the use of a retrospective assessment tool as a component of IPE evaluation. Earlier in the study, ICCAS scores aligned with subscale scores on the IPEC Self-Assessment, which provided support to substantiate the findings in the intervention group. However, in this case, the ICCAS was an effective tool to determine variations in perceptions of interprofessional collaboration competency.

It is reasonable to see how, upon reflection at the conclusion of the IPE course, physical therapy and communication sciences students would be able to pinpoint the areas in which they were lacking on the pretest portion of the survey. Over the course of the IPE experience, they gained a greater understanding of the many aspects of collaboration and teamwork where they initially lacked knowledge and skill. Potentially, the pretest ratings on traditionally formatted self-evaluations in these groups of novices were higher, and similar to more experienced peers because initially, students were unaware of what they did not know about IPE. It can be easy to underestimate the complexities and nuances of the practices required for effective teamwork, productive
collaboration, meaningful communication, and successful conflict management. Once students were required to not only learn about the concepts, but also practice the behaviors, they were better able to identify challenges, and their skill deficits. Use of the retrospective tool promoted reflection on the part of the students, which is an essential component of learning, and the growth process.

**Understanding the value of IPE.** Although students of different disciplines retrospectively reported variations in their initial levels of collaboration competence, they demonstrated some similarities in other areas in pretest data. All students who participated in the IPE experience initially reported high scores on the Values subscale of the IPEC Self-Assessment. There was no difference in the pretest levels among different majors, with each discipline reporting average scores of 4.4-4.6 out of 5. These scores are remarkably similar, given the different backgrounds, levels of education and skill development of the students. These results indicate that all of the participants held IPE in high regard and recognized its importance in professional practice. The more novice students may have demonstrated these high values for reasons similar to those noted earlier in the chapter. Although they were early in their professional and interprofessional development, their prior experiences may have influenced their perceptions of the value of IPE. Students who were further along in their education likely possess more professional experience, and may have engaged in IPC in various internships, practicum, or clinical placements. Their practical experiences serving clients in a team-based setting may have provided them real world insight into the importance of IPE. Both of these considerations may help to explain why students of all levels demonstrated similar, and consistently high levels of interprofessional values during the pretest.
IPE may influence students of different disciplines in similar ways. In addition to holding consistently high interprofessional values at the outset of the course, students of different disciplines who participated in IPE demonstrated consistent amounts of growth, and similar levels of interprofessional values and behaviors at the completion of the experience. Trends of the posttest and change score data allow for some interesting observations. Interprofessional values, as measured by the Values subscale of the IPEC Self-Assessment, remained high and changed the least over time, with each discipline improving 0.1-0.4 points, and posttest scores ranging from 4.5 to 4.75 out of 5. As student responses were nearing the top of the scale, perhaps the use of a scale that delineated a greater number of levels would have been more sensitive to subtle improvements and differences among students. In any case, the IPE experience appeared to reinforce and slightly improve the interprofessional values of students of all disciplines who participated.

Students who completed the IPE course also demonstrated similar amounts of change and similar posttest ratings in their self-perceived interprofessional behaviors, and collaboration competency. Students demonstrated the greatest amount of change over time, on the ICCAS, ranging from 0.7 to 1.1 points. They generally rated themselves lower on the ICCAS at the start of the experience, as well, with initial scores ranging from 3-3.8 out of 5, as opposed to 3.7 to 4.0 on the Interactions subscale of the IPEC Self-Assessment. This may be a function of the retrospective nature of the ICCAS, which provided students an opportunity for reflection on the particular skills required to effectively execute IPE.
Interprofessional behaviors, as measured by the Interaction subscale of the IPEC Self-Assessment, improved by 0.6 to 0.9 points across disciplines, which is more than the Values subscale, but less than the ICCAS. These improvements may be due to the teaching and learning methodology utilized in the IPE course, however the structure of the study limits the ability to establish the true influence of the IPE course, beyond the physical therapy students.

The analysis of student perceptions within IPE group allows for comparisons of their IPE experience, relative to various factors, such as major or previous interprofessional experience. The study of the intervention group alone does not attempt to quantify the influence of the IPE experience in a cause and effect manner. Rather, this analysis served to make comparisons among the population of students who participated to understand the ways in which it affected them. The information gained in this research allows one to infer that this particular IPE experience appeared to be of similar benefit to students of different backgrounds, majors, and at various points of professional development.

The study results from the intervention group are informative, in that they demonstrate this experience impacted different types of learners in similar ways. As limited research exists informing about the optimal length or intensity of IPE experiences (Fox et al., 2018), this information is helpful for educators as they evaluate and adjust this course. Continued tracking of these outcomes can inform faculty about the impact of course changes on cohorts of students. This data is also useful for the greater IPE community because it provides an indication of the relative significance of this type of experience to those who participated.
Understanding the relationship between IPE content and outcomes from a theoretical perspective. The provision of meaningful and effective IPE is a detailed and multistep process from conception to completion. It is helpful to utilize a theoretical framework to provide guiding principles. Attention must be given, not only to the physical act of bringing students together, but also to the ways in which they engage, with each other, and with the content, if we are truly engaging in the act of IPE, where students are learning, “With, from, and about each other, to improve collaboration and the quality of patient care” (CAIPE, 1997, p. 19).

As such, it is important to not only examine the outcomes of the IPE experience studied in this research, but to reflect on the theoretical underpinnings of the teaching and learning processes. The framework employed in this study was Lave and Wenger’s situated learning theory and communities of practice (Lave & Wenger, 1991; Wenger 1998). The framework is based on the premise that there is an inherently social nature to learning, because humans are social beings. The essence of much of the learning that occurs within IPE is social, as noted by its very definition. People engaged in shared work, learning together, and improving in their progress toward a common goal are termed communities of practice (Wenger, 1998). In this case, students who participated in IPE were engaged in learning as a social process, due to their placement in small interprofessional groups.

The simulations, interprofessional interview, and interprofessional case study provided students the time and space to establish relationships, respond to each other’s actions, exchange information, and practice skill building. Over time, through their common work, each group began to develop shared processes for engaging with each
other. Improvements in interprofessional behaviors and the collaboration competency noted in the students who participated in IPE are potentially a result of the collaborative work that they undertook within their communities of practice. Their peers in the control group did not have the opportunity to engage in learning about IPE in this manner, which may partially account for their lack of growth in their interprofessional behaviors. In a similar way, the fact that students were engaged in interprofessional communities of practice with one another may account in some ways for the fact that they all experienced a similar amount of change during the IPE experience.

**Limitations**

Although the results of this study were meaningful, there were some limitations inherent in its design. This research was quantitative in nature, and the data collected informs the reader about what changes did or did not occur in students, rather than the reasons why they occurred. In addition, this study relied on self-report data, collecting students’ perceptions of their interprofessional competency. Student reflections may lack insight and be less objective than observations offered by faculty facilitators completing a previously validated competency-based assessment, such as the Interprofessional Collaborator Assessment Rubric (ICAR).

Also, regardless of their personal experiences, all of the participants may have been influenced by the fact that they completed the surveys in the context of an IPE course. Their scores could have been influenced by response bias, and a desire to provide what they felt would be deemed the most socially acceptable responses. Finally, the study employed a relatively small sample size and measured change only on a short-term basis. Findings which emphasize the short-term changes of a small group are less
accurate and less generalizable to a larger population, in this case, students of health professions (Creswell & Creswell, 2018).

**Recommendations for Future Research**

The findings of this study reveal potential future research opportunities that may make meaningful contributions to the IPE literature. The first recommendation for future research would be to conduct further investigations of this IPE course using a different methodology. From a quantitative perspective, the addition of a standardized observer-based assessment would offer unbiased information about interprofessional behaviors from an objective third party, such as the ICAR.

The ICAR is a rubric designed to measure interprofessional competency as a means of student formative and summative assessment. It examines the development of interprofessional collaboration across six dimensions, including communication, roles and responsibilities, conflict management, collaboration, patient-centered care, and teamwork (Curran et al., 2011). Each of the dimensions includes descriptions of specific component skills and behaviors. Instructors rate students on the frequency with which they demonstrate these behavioral indicators during an interprofessional experience, using a scale from 1 to 4. Instructors also have the opportunity to provide comments, in addition to the numerical feedback (Curran et al., 2011). Use of a criterion-based assessment, such as the ICAR, provides students with a clear goal for expectations of proficiency (Curran et al., 2011). In addition, it can refine the planning and execution of IPE experiences, by providing focus and attention to the details of areas of emphasis (Curran et al., 2011). Feedback from an instrument such as the ICAR would complement the information gained from use of self-assessment tools. This, in turn, may lead to more...
substantial observations and outcomes regarding the influence of the course on students’ interprofessional behaviors.

A mixed methods study would offer additional insight into this IPE experience through the use of multiple lenses for data collection. The inclusion of qualitative analysis, through the use of written reflection, interviews, or focus groups, would provide greater insight into the individual experiences of students in the course, and help to build an understanding of why particular teaching methods are effective. A study of this sort would triangulate data from a variety of sources and garner information from two important stakeholders: students and faculty. Consequently, it would provide a more complete picture of the significance of the experience.

The second recommendation for future research would be to engage in comparative evaluations of different IPE experiences and strategies. This would allow for the examination of various features of IPE, including curriculum placement, intensity, duration, and instructional methodology, to understand their influence on outcomes. The knowledge gained would prove valuable insight when allocating resources for the provision of IPE, to ensure that institutions are offering instruction that most effectively and efficiently meets students’ needs.

There are practical implications to the translation of research on IPE efficacy into practice. The information gained from this area of inquiry would allow educators to thoughtfully align instruction with best practices aimed at achieving desired outcomes. This understanding is helpful for IPE educators, administrators of health professions’ programs, and institutions implementing IPE. The curricula of various disciplines tend to be highly structured, laden with courses intended to build professional competence, and
meet accreditation standards. There are limited opportunities when individual disciplines within organizations can effectively align necessities such as time, space, and faculty in support of IPE. The evidence would support administrators as they make decisions about the provision of IPE experiences. The identification of effective teaching methods and efficient IPE programming strategies supports the sustainability of IPE within educational institutions.

The third recommendation for future research is to follow students from the beginning of their college instruction throughout the course of their professional education and complete assessments of their interprofessional competence at various intervals. This could be done at specific time points, such as the conclusion of each semester, or each academic year. This type of longitudinal assessment would provide valuable information about the development of students’ interprofessional competencies over time. Alternatively, students could complete pre and posttest assessments at the start and conclusion of any IPE experience. This methodology would measure their interprofessional growth over the course of a particular experience, as opposed to a period of time. Additionally, it would allow researchers to focus on the influence of particular interventions on students’ interprofessional trajectory and pinpoint significant experiences and pivotal educational moments in their development of interprofessional competence.

The fourth recommendation is to continue this longitudinal study once students graduate and move into clinical practice. Researchers would be able to ascertain the cumulative impact of pre-professional IPE experiences on clinicians’ interprofessional practice. Individuals who are early in their career would likely rely heavily on the
experiences from their professional preparation as foundations for their practice. In addition, meaningful information could be gleaned from comparing the interprofessional competencies of new employees versus established professionals. This would help to build an understanding of the influences of educational experiences and workplace culture on one’s interprofessional formation and could contribute to the evidence regarding the long-term impacts of IPE on clinicians’ practice patterns.

The fifth recommendation for future research is for healthcare organizations to add to the body of evidence on IPE outcomes by engaging in research in this area. This may include longitudinal research evaluating the interprofessional competencies of employees over time, particularly before and after any IPE based professional development. Research of this scope would make meaningful contributions to the literature regarding the development of interprofessional competence across the continuum of experience, from early-career to experienced professionals (IOM, 2015). In addition, healthcare organizations may gather data to pursue answers to the question of IPE’s large-scale impact on Triple Aim outcomes, including the quality of patient experiences, the cost of healthcare services, and the health of individuals and communities (Lutfiyya, Brandt, & Cerra, 2016).

**Recommendations for Practice**

The findings from this research study indicate that an IPE experience improved the interprofessional behaviors of physical therapy students as compared to peers in a control group. In addition, students of different disciplines who participated in an IPE course experienced a similar amount of growth, and demonstrated similar posttest scores. However, physical therapy and communication sciences students began the experience
with significantly lower scores than nursing students. The insights gained from these findings lead to some practice recommendations for physical therapist educators, higher education administrators and healthcare organizations. The recommendations consider the implementation and outcomes of IPE on various levels and are explained in greater detail below.

**Recommendations for physical therapist educators.** Educators of physical therapists as well as other disciplines who are involved in the development and implementation of IPE should be guided by established frameworks, evidence, and identified best practices. These include the Canadian Interprofessional Competency Framework, IPEC’s Core Competencies for Interprofessional Collaborative Practice, and IOM’s IPLC Model learning outcomes, which are based on the Modified Kirkpatrick Model (CIHC, 2010; IOM, 2015; IPEC, 2016). Just as the use of an evaluation framework has been recommended in IPE, (Reeves et al., 2015), the recommendation is that IPE educators use a model for curriculum development when creating IPE interventions. Because the ultimate goal of IPE is the development of competencies, which will translate into practice, educators may be well served by using the Backward Design model as an approach (Wiggins & McTighe, 2005). This model has historically been utilized in primary and secondary education, with recent translation into higher education and the teaching of health professions (Emory, 2014).

Backward Design utilizes a three-step process for curriculum development that asks educators to first, determine the desired outcomes of learning; next, identify the evidence that outcomes have been achieved; and finally, plan authentic application-based learning activities (Wiggins & McTighe, 2005). The Backward Design philosophy is
complementary with IPE due to the fact that both are outcome-oriented and competency driven (Emory, 2014). The focus on learner outcomes, and their evaluation is consistent with recommendations in the IPE literature to consider evaluation and its purpose early in the IPE development process (Reeves et al., 2015).

Backward Design focuses on building long-term understanding of content, which is needed for the translation of knowledge into clinical practice (Emory, 2014). This focus on long-term meaningful understanding in curricular design could align well with outcomes assessment on a longitudinal scale, a previously identified need in IPE. Overall, because the process of Backward Design is outcome oriented, it fits well with both the goals of IPE and its opportunities for improvement. Outcome driven curriculum would facilitate the translation of IPE best practices from the literature while moving the field forward to a new level of excellence.

**Recommendations for higher education administrators.** The third recommendation for practice is for higher education administrators to allocate the resources needed for the effective provision and evaluation of IPE. IPE is resource intensive, due its logistical complexity (Wise et al., 2015). Educators indicate consistent barriers to implementing effective IPE, including lack of faculty time and workload credit, scheduling struggles, and lack of buy-in (Wise et al., 2015).

Health professions programs, such as physical therapy, are now required by their accrediting bodies to include IPE in programs, and ethically, institutions should be committed to preparing graduates who are able to work in healthcare teams (CAPTE, 2020; Lapkin, Levett-Jones, & Gilligan, 2013). Within higher education institutions, administrators are positioned to demonstrate institutional support through the building of
culture, development of faculty, and allocation of the resources to support the provision of high-quality IPE (Wise et al., 2015). High-level support such as this facilitates the sustainability of IPE across departments within organizations (Wise et al., 2015).

Administration also has the means to support comprehensive evaluation of IPE initiatives. This relates to not only quantitative and qualitative assessment of outcomes, but also includes the study of IPE implementation processes, costs and benefits. Administrative support of IPE assessment ultimately improves the quality of IPE, promotes faculty scholarship, and contributions to the IPE literature. Institutional support of IPE research through the provision of the time, space, and funding, demonstrates a commitment to IPE program development. In a symbolic way, these actions also signify an understanding of the types of effective, competent, and compassionate professionals that their institution aspires to develop through their years of professional preparation.

**Recommendations for healthcare organizations.** The final recommendation is for healthcare organizations to recognize and build interprofessional competence in their employees. Since interprofessional care is a component of patient centered care and supports the Triple Aim of healthcare (Brandt et al., 2014), it is incumbent upon healthcare organizations to hire clinicians who possess a strong interprofessional skill set, in addition to clinical expertise in their professional domain. When hiring early-career professionals, it is worthwhile to inquire about their interprofessional preparation, skill set and clinical experience. Similar consideration could be given to hiring experienced professionals, understanding that the combination of professional and interprofessional competence is a benefit to the organization.
Additionally, since the development of interprofessional competency is a continuum that extends beyond entry-level education, organizations should commit to facilitating the growth of their clinicians through continuing education opportunities (IOM, 2015). Professional development would allow for the building of knowledge and skills that could be practiced daily within the organization’s healthcare teams. Specific training in communication, teamwork, and conflict management skills would have a direct influence on patient care and patient outcomes in healthcare systems (IOM, 2015; IPEC, 2016).

Professional development on interprofessional collaboration can be planned, delivered, and evaluated with clear outcomes in mind and teaching methods aligned to the desired results. Interprofessional behaviors could be framed in the context of specific organizational workflows and processes. When healthcare organizations offer and evaluate continuing education on IPE across organizational divisions and settings, they communicate a consistent message to employees regarding the significance of teamwork and commitment to particular interprofessional practices. This allows organizations to embrace key concepts of interprofessional collaboration as part of their mission, culture, and identity.

The interprofessional development of clinicians in healthcare organizations could be tracked over time, to discern its large-scale impact at the highest levels, organizational change, individual health outcomes, and community health (IOM, 2015). This much-needed research would further substantiate the importance of interprofessional collaboration and its direct impact on healthcare (Lutfiyya et al., 2016; Lutfiyya, Chang, McGrath, Dana, & Lipsky, 2019). It would also help to strengthen the continuum of IPE.
research from undergraduate education, to graduate education to professional development.

Conclusion

The educators of healthcare professionals are called to provide their students with a meaningful interprofessional education. This mandate comes from the accrediting bodies of various disciplines, healthcare commissions, regulatory agencies, and scholarly literature. Healthcare providers use their knowledge, skills and professional competence in the service of caring for people. Interprofessional collaboration is required to effectively engage in this work and for patients to safely navigate this country’s complex healthcare system. As a result, educators should be driven to provide as robust an education in interprofessional competencies as they offer in discipline-specific knowledge, skills, and behaviors. This preparation cultivates professionals who are prepared to enter the workforce ready to engage in service through team-based care.

Interprofessional competency frameworks have been established, including the Canadian Interprofessional Competency Framework and IPEC’s Core Competencies for Interprofessional Practice (CIHC, 2010; IPEC, 2016). These frameworks delineate the specific values, knowledge, skills, and behaviors required to demonstrate competence in the domain of interprofessional collaboration. They were established to guide IPE’s implementation, accreditation guidelines and scholarly literature (IPEC, 2016). The Institute of Medicine (2015) also established the IPLC Model to outline a framework for assessment of IPE in the education and healthcare systems. The learning outcomes noted in this model are based on the Modified Kirkpatrick Model and range from changes in reactions to changes in practice and patient outcomes (Barr et al., 2000; IOM, 2015).
Physical therapy is a healthcare profession tasked with the provision of IPE (CAPTE, 2020). Doctor of Physical Therapy programs, in addition to other allied health and medical programs, face challenges when implementing IPE. These range from intensive resource requirements to scheduling complexities, to lack of support (Reeves et al., 2016; Wise et al., 2015). In addition, gaps exist with regard to understanding the impact of IPE interventions, particularly on higher level learning outcomes, such as behavior (Fox et al., 2018; Reeves et al., 2015; Reeves et al., 2016). The need exists to engage in effective evaluation of IPE in order to better understand how IPE experiences develop interprofessional competence and which are the most effective in generating the desired outcomes (Fox et al., 2018; Reeves et al., 2015; Reeves et al., 2016).

This study considered the influence of an IPE experience on the interprofessional values and behaviors of Doctor of Physical Therapy students. It also examined the interprofessional values and behaviors of students who participated in IPE, in comparison to one another. Physical therapy students who participated in IPE experienced an improvement in their interprofessional behaviors that their peers in a control group did not. All of the students who participated in IPE demonstrated a high level of interprofessional values. The interprofessional behaviors of physical therapy and communication sciences students were significantly lower than nursing students at the beginning of the IPE experience. However, students of all disciplines experienced a similar amount of growth in their perceived interprofessional behaviors throughout the IPE experience.

These findings speak to the ability of IPE to change students’ interprofessional values and behaviors. In addition, they indicate the importance of IPE curriculum
development. It is essential to align IPE learning objectives, with meaningful teaching and learning interventions and appropriate assessment measures. Institutional administration, faculty members, and students should be invested in the importance of interprofessional development through IPE programming and evaluation at the pre-entry level. This supports effective provision of the IPE curriculum, and can also contribute to the IPE literature.

Programs that educate future healthcare professionals seek to nurture the development of interprofessional values, knowledge, skills, and behavior in the same manner that their discipline-specific competencies are encouraged. In order to accomplish this task, thoughtful attention and resources should be directed toward IPE, so that it is implemented in a manner that reflects best practices on teaching, learning, and assessment. Students will leave their higher education institutions and enter the healthcare system as providers prepared to engage in interprofessional collaboration and team-based care.

A strong, flexible, and collaborative workforce is necessary to manage complex health problems, including community health, an aging population, and disease epidemics (World Health Organization [WHO], 2010). Each student who enters the workforce prepared to engage in interprofessional collaborative practice is armed with the potential to improve their patient’s health and their experience of healthcare. The impact of this individual potential is magnified with the collective practice of interprofessional collaboration across disciplines throughout levels of the healthcare system. Widespread interprofessional collaboration has the power to enhance the quality and safety of the patient experience (Baker et al., 2005; Berwick et al., 2008; IOM, 1999;
IOM, 2001; IOM, 2003a). As healthcare professionals utilize their interprofessional education to engage in interprofessional collaborative practice, they will transform the manner in which they care for people. The positive effects will reverberate through healthcare organizations, and ultimately, improve the lives of individuals and the health of the communities they serve.
References


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Appendix A

Core Competencies for Interprofessional Practice (IPEC, 2016, pp 11-14)

Work with individuals of other professions to maintain a climate of mutual respect and shared values. (Values/Ethics for Interprofessional Practice)

Values/ Ethics Subcompetencies
1. Place interests of patients and populations at center of interprofessional health care delivery and population health programs and policies, with the goal of promoting health and health equity across the life span.

2. Respect the dignity and privacy of patients while maintaining confidentiality in the delivery of team-based care.

3. Embrace the cultural diversity and individual differences that characterize patients, populations, and the health team.

4. Respect the unique cultures, values, roles/ responsibilities, and the expertise of other health professions and the impact these factors have on health outcomes.

5. Work in cooperation with those who receive care, those who provide care, and others who contribute to or support the delivery of prevention and health services and programs.

6. Develop a trusting relationship with patients, families and other team members (CIHC, 2010).

7. Demonstrate high standards of ethical conduct and quality of care in contributions to team based care.

8. Manage ethical dilemmas specific to interprofessional patient/ population centered care situations.

9. Act with honesty and integrity in relationships with patients, families, communities and other team members.

10. Maintain competence in one’s own profession appropriate to scope of practice.
Use the knowledge of one’s own role and those of other professions to appropriately assess and address the health care needs of patients and to promote and advance the health of populations. (Roles/Responsibilities)

1. Communicate one’s roles and responsibilities clearly to patients, families, community members and other professionals.

2. Recognize one’s limitations in skills, knowledge, and abilities.

3. Engage diverse professionals who complement one’s own professional expertise, as well as associated resources, to develop strategies to meet specific health and health care needs of patients and populations.

4. Explain the roles and responsibilities of other providers and how the team works together to provide care, promote health and prevent disease.

5. Use the full scope of knowledge, skills, and abilities of professionals from health and other fields to provide care that is timely, efficient, effective, and equitable.

6. Communicate with team members to clarify each member’s responsibility in executing components of a treatment plan or public health intervention.

7. Forge independent relationships with other professions within and inside the health system to improve care and advance learning.

8. Engage in continuous professional and interprofessional development to enhance team performance and collaboration.

9. Use unique and complementary abilities of all team members to optimize health and patient care.

10. Describe how professionals in health and other fields can collaborate and integrate clinical care and public health interventions to optimize public health.

Communicate with patients, families, communities, and professionals in health and other fields in a responsive and responsible manner that supports a team approach to the promotion and maintenance of health and the prevention and treatment of disease. (Interprofessional Communication)

1. Choose effective communication tools and techniques, including information systems and communication technologies, to facilitate discussions and interactions that enhance team function.

2. Communicate information with patients, families, community members, and health team members in a form that is understandable, avoiding discipline specific terminology when possible.
3. Express one’s knowledge and opinions to team members involved in patient care and population health improvement, with confidence, clarity and respect, working to ensure common understanding of information, treatment, care decisions, and population health programs and policies.

4. Listen actively, encourage ideas and opinions of other team members.

5. Give timely, sensitive, instructive feedback to others about their performance on the team, responding respectfully as a team member to feedback from others.

6. Use respectful language appropriate for a given difficult situation, crucial conversation, or conflict.

7. Recognize how one’s uniqueness (experience level, culture, expertise, power and hierarchy within the health team) contributes to effective communication, conflict resolutions, and positive interprofessional working relationships (University of Toronto, 2008).

8. Communicate the importance of teamwork in patient centered care and health team programs and policies.

Apply relationship building values and the principles of team dynamics to perform effectively in different roles to plan, deliver, and evaluate patient/ population centered care and population health programs that are safe, timely, efficient, effective, and equitable. (Teams and Teamwork).

1. Describe the process of team development and the roles and practices of effective teams.

2. Develop consensus on the ethical principles to guide all aspects of teamwork.

3. Engage health and other professionals in shared patient centered and population focused problem solving.

4. Integrate the knowledge and experience of health and other professions to inform health and health care decisions while respecting patient and community values and priorities/ preferences for care.

5. Apply leadership practices that support collaborative practice and team effectiveness.

6. Engage self and others to constructively manage disagreements about values, roles, goals and actions that arise among health and other health professionals and with patients, families, and community members.

7. Share accountability with other professions, patients, and communities for outcomes relevant to prevention and health care.

8. Reflect on individual and team performance for individual, as well as team, performance and improvement.
9. Use process improvement to increase effectiveness of interprofessional teamwork, as well as team-based services, programs, and policies.

10. Use available evidence to inform effective teamwork and team-based practices.

11. Perform effectively on teams, and in different team roles in a variety of settings.
Appendix B

Demographics Form

Age (in years): __________

Gender:
- [ ] Male
- [ ] Female
- [ ] Nonbinary
- [ ] Other (please specify):
- [ ] Prefer not to say

Which categories describe you? Select all that apply to you:
- [ ] American Indian or Alaska Native
- [ ] Asian
- [ ] Black or African American
- [ ] Hispanic, Latino or Spanish Origin
- [ ] Middle Eastern or North African
- [ ] Native Hawaiian or Other Pacific Islander
- [ ] White
- [ ] Some other race, ethnicity, or origin, please specify: __________
- [ ] I prefer not to answer.

Discipline/Major/Minor:
- [ ] Physical Therapy
- [ ] Occupational Therapy
- [ ] Nursing
- [ ] Pre-Medical
- [ ] Communication Sciences and Disorders
- [ ] Creative Arts Therapy/ Music Therapy
- [ ] Education

Are you an Undergraduate or Graduate Student:
- [ ] Undergraduate
- [ ] Graduate

What is the academic degree you will earn at the end of your program?
- [ ] Bachelor’s Degree
- [ ] Master’s Degree
- [ ] Doctoral Degree

Anticipated completion date of your degree (include month and year)?
Month: 1 2 3 4 5 6 7 8 9 10 11 12
Year: 2019 2020 2021 2022
Have you clinically practiced as part of an interprofessional team? (This may include rounds, team meetings, clinical experiences with other professions in individual or group settings on or off campus)

- Yes  - No

If yes, how often?

- Very Infrequently  - Somewhat Infrequently  - Occasionally  - Somewhat Frequently  - Frequently

What kind of interprofessional practice have you been involved in?  (Select all that apply. )

- Full Time Off Campus Clinical/ Professional Placements
  Number of weeks ________

- Part Time Off Campus Clinical/ Professional Placements
  Hours per week ________  Number of weeks ________

- Full Time On Campus Clinical/ Professional Placements
  Hours per week ________  Number of weeks ________

- Part Time On Campus Clinical/ Professional Placements
  Hours per week ________  Number of weeks ________

- Other (please specify):
  Hours per week ________  Number of weeks ________

What types of activities took place as part of your interprofessional practice?

- Individual Co-treatments

- Treatment Groups with collaborative interprofessional facilitation

- Interprofessional team meetings

- Daily rounds

- Family meetings

- Other (Please specify)______________________________
### The Interprofessional Collaborative Competency Attainment Scale (Revised)

**Appendix C**

**The Interprofessional Collaborative Competency Attainment Scale (Revised)**

Using the following scale, please rate your ability for each of the following statements.

1 = "Poor", 2 = "Fair", 3 = "Good", 4 = "Very good", 5 = "Excellent"

<table>
<thead>
<tr>
<th>Statement</th>
<th>Before participating in the learning activities, I was able to</th>
<th>After participating in the learning activities, I was able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Promote effective communication among members of an interprofessional (IP) team</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>2. Actively listen to IP team members' ideas and concerns</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>3. Express my ideas and concerns without being judgmental</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>4. Provide constructive feedback to IP team members</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>5. Express my ideas and concerns in a clear, concise manner</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>6. Seek out IP team members to address issues</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>7. Work effectively with IP team members to enhance care</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>8. Team with, from and about IP team members to enhance care</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>9. Identify and describe my abilities and contributions to the IP team</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>10. Be accountable for my contributions to the IP team</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>11. Understand the abilities and contributions of IP team members</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>12. Recognize how others' skills and knowledge complement and overlap with my own</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>13. Use an IP team approach with the patient to assess the health situation</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>14. Use an IP team approach with the patient to provide whole person care</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>15. Include the patient/family in decision-making</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>16. Actively listen to the perspectives of IP team members</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>17. Take into account the ideas of IP team members</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>18. Address team conflict in a respectful manner</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>19. Develop an effective care plan with IP team members</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
<tr>
<td>20. Negotiate responsibilities within overlapping scopes of practice</td>
<td>P 2 3 4 5</td>
<td>P 2 3 4 5</td>
</tr>
</tbody>
</table>

21. Compared to the time before the learning activities, would you say your ability to collaborate interprofessionally is... (circle one)

1 = Much better now, 2 = Somewhat better now, 3 = About the same, 4 = Somewhat worse now, 5 = Much worse now

**Appendix D**

**IPEC Competency Self-Assessment Tool**

**VERSION 3 (July 2015)**

**INSTRUCTIONS:** Based on your education or experience in the health care environment, select/circle the number that corresponds with your level of agreement or disagreement on each item. For more information, contact Kelly Lockeman, PhD, Virginia Commonwealth University (kslockeman@vcu.edu).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I am able to choose communication tools and techniques that facilitate effective team interactions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>I am able to place the interests of patients at the center of interprofessional health care delivery.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>I am able to engage other health professionals in shared problem-solving appropriate to the specific care situation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>I am able to respect the privacy of patients while maintaining confidentiality in the delivery of team-based care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>I am able to inform care decisions by integrating the knowledge and experience of other professions appropriate to the clinical situation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>I am able to embrace the diversity that characterizes the health care team.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>I am able to apply leadership practices that support effective collaborative practice.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>I am able to respect the cultures and values of other health professions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>I am able to engage other health professionals to constructively manage disagreements about patient care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>I am able to develop a trusting relationship with other team members.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>I am able to use strategies that improve the effectiveness of interprofessional teamwork and team-based care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>I am able to demonstrate high standards of ethical conduct in my contributions to team-based care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>I am able to use available evidence to inform effective teamwork and team-based practices.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>I am able to act with honesty and integrity in relationships with other team members.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>I am able to understand the responsibilities and expertise of other health professions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>I am able to maintain competence in my own profession appropriate to my level of training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix E

Course Learning Objectives, Class Themes, Learning Outcomes and Learning Strategies Employed in IPE

At the completion of this course students will be able to:

1. Identify and analyze the key components of a profession and what it means to have a body of knowledge, a scope of practice, and a social contract with society.

2. Define and describe the roles and areas of expertise of various stakeholders (professionals, patients, students, families, caregivers etc.) on an interprofessional team.

3. Define and describe overlapping professional and individual values, ethics, competencies (e.g. cultural) and responsibilities of interprofessional team members.

4. Demonstrate the knowledge and skills for working within a collaborative model (e.g. cooperation, assertiveness, responsibility, communication, autonomy & coordination).

5. Assess and analyze the core components of effective interprofessional collaboration such as roles, group dynamics, and strategies for collaboration, systematic support.

6. Demonstrate the ability to engage in the process of effective interactive problem solving, conflict resolution, and ethical decision-making.
Figure E1

<table>
<thead>
<tr>
<th>Class Session</th>
<th>Targeted Learning Outcomes</th>
<th>Learning Strategies</th>
<th>Preparatory Work</th>
<th>Assignments</th>
</tr>
</thead>
</table>
| 1 (Large Group Meeting) | 1,2,3,4 | • Introductory Lecture: What is IPE/ IPCP?  
• Small Group Introductions  
• Assignment Review  
• Team Building Activity | • Review World Health Organization Framework for Action on IPE  
• Review Discipline Fact Sheets  
• Review Profession Specific Code of Ethics  
• Watch Video: Core IPE concepts  
• Complete online Quiz #1 on resources provided | • Review the case study for the first small group session. Prepare written notes regarding the discussion prompts in the case so that you can be ready to discuss your profession's role.  
• Partner with a student in your small group from another profession. You and your partner will have a professional conversation/interview to help you learn about each other's profession. The conversation should be at least one hour in length. Use the provided questions to guide your conversation with your partner. Carefully document your partner’s responses as they will guide your discussion during the next small group session. |
| 2 (Small group) | 1,2,3,4,5 | • Facilitated Discussion of Interprofessional Case Study  
• Facilitated Discussion of Interprofessional Interviews  
• Formulate team plan for simulation in class 3 | • Watch Video: Collaboration  
• Watch Simulation Introduction Video  
• Complete Online Quiz #2 | • Complete Interprofessional Paper: Describe your plan for your first professional job following graduation (e.g., setting, population, location, etc.) Find a peer-reviewed article from any other profession that applies to that desired job. Write a ~600-word paper about what your “dream” job is and what you learned from the other profession that would apply to this job. |
<table>
<thead>
<tr>
<th>3 (Small Group and Large Group)</th>
<th>Simulation: Medical and Education Scenarios: 5-minute huddle, 60-minute simulation, 30-minute debrief</th>
<th>Review simulation overview materials and consider your professional role in the simulation.</th>
<th>Create a post in the simulation online forum within 24 hours of the simulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,3,4,5,6</td>
<td>Large group simulation debrief</td>
<td>Watch video: Communication</td>
<td>Complete online Quiz #3</td>
</tr>
<tr>
<td></td>
<td>Final lecture on IPE/IPCP and in your profession</td>
<td>Complete readings on teamwork</td>
<td></td>
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<tr>
<td></td>
<td>Small and large group hot topic discussion</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Prepare for Hot Topic discussion: A Hot Topic is an issue that is heavily discussed or debated within a profession. At times, the Hot Topic may transcend a profession, and is relevant to more than one profession. With the support of your faculty facilitator, research a specific Hot Topic from your profession's perspective. Be prepared to share your findings and discuss with your small group.</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix F

Table F1

*Examination of the Relationships between IPEC’s Core Competencies for Interprofessional Practice, IPE Course Learning Objectives, IPEC Competency Self-Assessment Subscale Items and ICCAS Items*

<table>
<thead>
<tr>
<th>IPEC Competency / IPLC Outcome Level</th>
<th>Course Learning Objective</th>
<th>IPEC Values</th>
<th>IPEC Interactions</th>
<th>ICCAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roles &amp; Responsibilities, Values &amp; Ethics</td>
<td>Identify and Analyze the key components of a profession body of knowledge, scope of practice, social contract with society</td>
<td>16</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Reaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitudes/ Perceptions Knowledge/ Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roles &amp; Responsibilities, Values &amp; Ethics</td>
<td>Describe the roles and expertise of stakeholders on an interprofessional team</td>
<td>2,6</td>
<td>5</td>
<td>9, 10,11, 14,15</td>
</tr>
<tr>
<td>Attitudes/ Perceptions Knowledge/ Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roles &amp; Responsibilities, Values &amp; Ethics</td>
<td>Describe overlapping professional &amp; individual values, ethics, competencies and responsibilities of IP team members</td>
<td>4,6,8,12,14</td>
<td>11</td>
<td>10,11,12, 20</td>
</tr>
<tr>
<td>Attitudes/ Perceptions Knowledge/ Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication Teams &amp; Teamwork (Continued)</td>
<td>Demonstrate knowledge and skills for a collaborative model (Cooperation, assertiveness, responsibility, communication, autonomy, coordination</td>
<td>6,8,10</td>
<td>1,7,9,11</td>
<td>1-4,5,8,16,17</td>
</tr>
<tr>
<td>Communication</td>
<td>Assess and Analyze core components of effective interprofessional collaboration (roles, group dynamics, collaboration and support strategies)</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Teams &amp; Teamwork</td>
<td>2,10,12</td>
<td>11,13,15</td>
<td>7,8,13,17,19</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication</th>
<th>Demonstrate the ability to engage in interactive problem solving, conflict resolution, ethical decision making</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teams &amp; Teamwork</td>
<td>2,10,12,14</td>
</tr>
</tbody>
</table>
Appendix G

Table G1
*Examination of Relationships between IPLC Learning Outcomes, IPE Course Learning Objectives, and IPE Course Activities*

<table>
<thead>
<tr>
<th>Course Activities</th>
<th>Course Learning Objective</th>
<th>IPLC Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture: What is IPE/ IPCP?, Reading: WHO Framework, Video: IPE Concepts</td>
<td>1, 2</td>
<td>Knowledge/ Skills</td>
</tr>
<tr>
<td>Reading: Discipline fact sheets and codes of ethics, Experience: Small group introductions, team building activity</td>
<td>1, 2, 3</td>
<td>Reactions, Attitudes/ Perceptions, Knowledge/ Skills</td>
</tr>
<tr>
<td>Experience: Discipline specific hot topic research, discussion</td>
<td>1, 3</td>
<td>Attitudes/ Perceptions, Knowledge/ Skills</td>
</tr>
<tr>
<td>Experience: Interprofessional interview (1:1), small group Discussion</td>
<td>2, 3</td>
<td>Reactions, Attitudes/ Perceptions, Knowledge/ Skills</td>
</tr>
<tr>
<td>Experience: Interprofessional case study group activity Video: Collaboration</td>
<td>3, 4, 6</td>
<td>Attitudes/ Perceptions, Knowledge/ Skills Behaviors</td>
</tr>
<tr>
<td>Experience: Interprofessional simulation &amp; debrief-medical setting Video: Communication</td>
<td>4, 5, 6</td>
<td>Attitudes/ Perceptions, Knowledge/ Skills Behaviors</td>
</tr>
<tr>
<td>Experience: Interprofessional simulation &amp; debrief-educational setting Reading: Teamwork</td>
<td>4, 5, 6</td>
<td>Attitudes/ Perceptions, Knowledge/ Skills Behaviors</td>
</tr>
</tbody>
</table>
Appendix H

St. John Fisher College Institutional Review Board

Statement of Informed Consent for Adult Participants

SUMMARY OF KEY INFORMATION:

- You are being asked to be in a research study of students participating in an interprofessional education experience. As with all research studies, participation is voluntary.
- The purpose of this study is to understand the influence of an educational experience on the interprofessional values and behaviors of students in the health or education professions.
- Approximately 110 people will take part in this study. The results will be used for a doctoral dissertation, and to inform scholarship in the teaching and learning of interprofessional education.
- If you agree to take part in this study, you will be involved in this study for approximately 15 minutes each on two separate days in September and October of 2019.
- Students who participate will be asked to complete a demographics form and two brief self-assessment surveys as pretests and post-tests in September and October 2019 at Nazareth College. The surveys will take approximately 15 minutes to complete. Students in the intervention group will be given time in the first and last class of their interprofessional education course to complete the surveys if they choose to participate. Students in the control group will be given time to complete the surveys during a class of a required first year physical therapy course if they choose to participate. More detail will be provided in the consent form.
- We believe this study has no more than minimal risk. 15 minutes will be required on two different occasions to complete the surveys for the study.
- You may not directly benefit from this research; however, we hope that your participation in the study may inform teachers and students involved in interprofessional education.

DETAILED STUDY INFORMATION (some information may be repeated from the summary above):
You are being asked to be in a research study of students participating in an interprofessional education experience. This study is being conducted in two classrooms at Nazareth College. This study is being conducted by: Jennifer Fay, PT, MS. Faculty Member: Joshua Fegley, Ed. D. in the Doctorate in Executive Leadership program, Kathleen Dever, Associate Professor, Wegmans School of Nursing at St. John Fisher College.
You were selected as a possible participant because you are enrolled in the interprofessional education course this semester, or you are a first-year physical therapy student who is not participating in interprofessional education this semester.

Please read this consent form and ask any questions you have before agreeing to be in the study.

PROCEDURES:

If you agree to be in this study, you will be asked to do the following:
Complete a demographics form and two self-assessment surveys before and after an educational experience. Each survey contains 16-20 statements that you will rate yourself on, using a 5-point scale. Students will be introduced to the study and given time to complete the pretest surveys during a class session today and again in 5 weeks. It will take about 15 minutes to complete the surveys each day.

Pretesting: 9/26-27/2019 Students will complete the demographics form and IPEC Competency Self-Assessment. Time to complete: 15 minutes.

Post-Testing: 10/24-25/2019 Students will complete the IPEC Competency Self-Assessment and the Interprofessional Collaboration Competency Attainment Scale. Time to complete: 15 minutes.

COMPENSATION/INCENTIVES:

You will not receive compensation/incentive.

CONFIDENTIALITY:

The records of this study will be kept private and your confidentiality will be protected. In any sort of report the researcher(s) might publish, no identifying information will be included.

Identifiable research records will be stored securely and only the researcher(s) will have access to the records. All data will be kept in a locked filing cabinet in the researcher’s office by the investigator. All study records with identifiable information, including approved IRB documents, and consent forms, will be destroyed by shredding and/or deleting after 3 years.

VOLUNTARY NATURE OF THE STUDY:

Participation in this study is voluntary and requires your informed consent. Your decision whether or not to participate will not affect your current or future relations with St. John Fisher College or with Nazareth College. If you decide to participate, you are free to skip any question that is asked. You may also withdraw from this study at any time without penalty.
CONTACTS, REFERRALS AND QUESTIONS:
The researchers(s) conducting this study: Jennifer Fay. If you have questions, you are encouraged to contact the researcher(s) at the Nazareth College York Wellness and Rehabilitation Institute, Room 165, 389-4749, or Jfay0@naz.edu. You may also contact her Dissertation Committee Chair, Dr. Joshua Fegley, at 395-5538, or jfegley@sjfc.edu.

The Institutional Review Board of St. John Fisher College has reviewed this project. For any concerns regarding this study/or if you feel that your rights as a participant (or the rights of another participant) have been violated or caused you undue distress (physical or emotional distress), please contact the SJFC IRB administrator by phone during normal business hours at (585) 385-8012 or irb@sjfc.edu.

STATEMENT OF CONSENT:

I am 18 years of age or older. I have read and understood the above information. I consent to voluntarily participate in the study. My completion of the survey documents implies my consent to participate.

Please keep a copy of this informed consent for your records.