What Does the Development of an Interprofessional Education (IPE) Program Encompass: Including Outcomes, When Implementing the Curriculum into a Small Technical College?

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WHAT DOES THE DEVELOPMENT OF AN INTERPROFESSIONAL EDUCATION (IPE) PROGRAM ENCOMPASS: INCLUDING OUTCOMES, WHEN IMPLEMENTING THE CURRICULUM INTO A SMALL TECHNICAL COLLEGE?

BY

Glenn M. Levicki

A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree Doctor of Health Administration in the College of Health Professions
“What Does the Development of an Interprofessional Education (IPE) Program Encompass: Including Outcomes, When Implementing the Curriculum into a Small Technical College?”

BY

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Glenn M. Levicki

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The purpose of this case study was to determine what Interprofessional Education (IPE) encompasses, the outcomes of implementing IPE in college curricula, and how attainable it is to use IPE to enhance collaboration among healthcare professionals. The contemporary and correlated literature was reviewed to contribute to knowledge and solve the research dilemma that revolves around (IPE). The main areas investigated were what encompass IPE, the educational outcomes and erudition experiences of IPE students, development and implementation of IPE curriculum, and effects of IPE. The emphasis of the study was to establish what encompasses the development and implementation of IPE curriculum. Results indicated that IPE is a new collaborative conception useful for improving student outcomes, and in turn also increasing patient care. Therefore, elevating delivery of quality services, reduced medical errors, improved problem solving and communication skills, and teamwork among healthcare professionals.
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Chapter 1: Introduction

Interprofessional Education (IPE) is becoming an important tool for training well-rounded professionals who can function as part of a team in the complex healthcare environment in which students will practice. IPE has been shown to improve quality of patient care and increased patient satisfaction (Watters, et al., 2015). However, the process used for developing IPE content into health professions curricula is non-standardized and appears to vary greatly by profession. Furthermore, the process used for implementing IPE into a curriculum is poorly understood outside of the realm of medical training in academic medical centers. Reports indicate that it takes a collaborative effort of the entire faculty involved to succeed, and that it may take months or even years to change practice culture through IPE. Most importantly, most reports focus on graduate medical and nursing education (Buring, et al., 2009). However, much of the work in health care settings is performed by individuals who are educated in community colleges, in certificate or associate degree programs. It is essential that these members of the health care team also have the benefits of IPE education. Without this exposure they may be expected to fit sub-optimally into the culture of their future work place.

The purpose of this study was to design and implement IPE teaching in a small community college and to report what we learned in the form of a case study. The study had two major objectives: 1) To identify from the literature relevant features of IPE that we should consider during our design and implementation phase; and 2) to describe the process that we used and the outcomes that we have observed to date. We performed an extensive literature review to determine: 1) what IPE encompasses, 2) the reported results of implementing IPE in college curricula, and 3) the strengths and weakness reported for
using IPE to boost collaboration among healthcare professionals. We examined the IPE literature and related educational theory papers used to explain research issues that revolve around IPE’s development and implementation, including conclusions as they apply. The main topics investigated were; what areas are integrated within IPE, the educational outcomes measured and the reported experiences of IPE students, and the processes and plans used in the development, implementation and measurement of the effects of an IPE curriculum. Based on the conceptual framework and process recommendations identified in the literature we designed and implemented an IPE program and measured its impact on selected student learning objective in a small community college setting. First, we report the results of our findings in the literature, with emphasis on what we found of relevance for our organizational setting; Secondly, we report on the process used and the content of the IPE curriculum developed; and lastly we show the early results on student learning.

The organization of the manuscript is outlined as follows. In Chapter 2, current related literature and existing knowledge related to IPE is reviewed. The chapter begins by exploring the concept of IPE, what IPE encompasses, enhancing collaboration using IPE, elements that constitute IPE, effectiveness of IPE and the outcomes because of using IPE. Chapter 3 presents the conceptual framework, process, and methodology used in the study.
Chapter 2: Review of Current and Related Literature

Background of IPE

According to Watters, et al. (2015) practices of collaboration and interprofessionalism have been the foremost healthcare debate in the last 50 years. An assortment of organizations, such as World Health Organization (WHO), General Medical Council, Advancement of Interprofessional Education in UK, and Nursing and Midwifery Council have indicated that there are plentiful benefits of collaborative and interprofessional methods in healthcare delivery (Watters, et al., 2015; Buring, et al., 2009).

The support for IPE has increased tremendously over time and most of the scholars have outlined some merits of IPE; the practice helps in improving healthcare outcomes (Watters, et al., 2015). IPE is a new technique that has emerged and it is meant to provide opportunities for healthcare professionals in maximizing learning conclusions through consolidation. It is apparent that education is one of the practices that endorses collaborative efforts for present and future healthcare professionals.

Researchers, educators and policy makers have become more interested in interprofessional education as a method of enlightening collaboration among healthcare professionals to augment improved patient care (Dudley & Wiysonge, 2008). Patient care and management communication, along with teamwork amid medical practitioners aim to help in synchronization of services obtainable. Despite this prerequisite, research shows that there are numerous challenges facing collaborative and communicative efforts among healthcare practitioners (Reeves, Perrier, Goldman, Freeth & Zwarenstein, 2013).
The task of caring for patients is very demanding. Professionals who provide health and social care for patients consequently need to work in concert as a team. Research shows that some healthcare professionals do not work collectively (Reeves, Perrier, et al., 2013). Interprofessional education is a stratagem that can be used to augment collaboration, which will in turn lead to enhanced patient care.

Interprofessional education entails acquiring knowledge where students who belong to two or more professions learn collectively during professional training to enhance collaboration or teamwork. This awareness of combined cooperation is helpful when delivering healthcare to various patients. Students who belong to other professions can also participate in interprofessional learning whereby members who belong to more than one social or healthcare profession interact with each other and learn how to improve the services offered to patients (Reeves, Perrier, et al., 2013). Since many people are advocating for IPE implementation, it is necessary to investigate whether IPE can contribute to development of collective knowledge and skills among medical professionals to enhance effective collaboration. The effectiveness of IPE is currently an ongoing debate. Few scholars have investigated the usefulness of IPE. Hence, there is a need to conduct further research which examines the effectiveness of IPE in relation to service quality, and the experience of patients.

Various medical schools in the USA are incorporating IPE in their curriculum. Even though IPE programs have been in existence for some time, they are currently on the rise. Most people consider these programs as methods of decreasing medical errors and improving services provided in healthcare systems. According to Dominguez, Fike, et al. (2015) organizations in the world are embracing and promoting IPE through
collaborative efforts aimed at improving healthcare system services. Among others, there are IPE programs credited for nurses, pharmacists, health administration, optometry and physical therapy.

IPE is essential for efficient and effective healthcare delivery. Patients have a wide range of needs that must be met. Most of the previous studies suggest that there is no communication or collaboration among healthcare professionals as they deliver healthcare (Reeves, Perrier, et al., 2013). This shows the necessity of collaboration among health professions such as physicians, nurses, therapists, nutritionists and psychologists. Various scholars have linked interprofessional education to innumerable outcomes. IPE leads to improved case and safety management of patients, enables team members in various health professionals to use their skills optimally, and leads to delivery of better healthcare services (Berridge, Mackintosh, & Freeth, 2010). According to Dudley and Wiysonge (2008) IPE leads to improved departmental culture, increased competency among health professionals, low number of clinical errors, and collaborative behavior among team members. The following are additional positive outcomes that have been associated with IPE; improved patient safety due to reduction in error rates, improvements in the departments of emergencies, and increased competency among mental healthcare practitioners (Watters, et al., 2015). However, the evidence on IPE effectiveness is currently scarce. For instance, the impact of IPE on quality of care delivered to patients, patient satisfaction, and clinical outcomes is not very clear (Dudley & Wiysonge, 2008).

Most of the reviews indicate that there are limitations in most of the evidence presented (Reeves, Boet, Zierler & Kitto, 2015). As noted by Dudley and Wiysonge...
(2008) studies that have been conducted in countries with high income indicate that there
is low quality of evidence supporting the effectiveness of IPE. Most of the reviews have
recommended further research in the field of IPE, with more evidence. As such, there is
need for further research to determine the effects of IPE on healthcare outcomes and
health professional practice. This study was meant to examine what IPE entails, the
effectiveness of its implementation and related outcomes.

**Methods Used for Literature Review**

The research within was aimed at collecting reliable information from different
sources that address the subject of IPE and its effectiveness among health practitioners.
This chapter provides a review of the information obtained from the various sources
identified. Secondary sources such as journals, reports, books and other published
research dissertations were the primary sources of the information used in this study. The
rationale for determining the suitability of an information source for this study was
obtained from the research question.

**Search Strategy**

In this case study, the literature review also includes information from published
dissertation research studies, peer-reviewed articles, and several online database
resources that includes EBSCO host, ProQuest, SAGE and Wiley online database,
Harvard Business, Capella digital library, and thesis and dissertation databases. The
background of IPE is provided to give the foundation of the topic under study. The
chapter concludes with a discussion of IPE outcomes, which indicates how effective the
strategy is as investigated by various researchers.

The main key concepts used to search for related literature included:

- interprofessional education
• interprofessional education development
• IPE implementation
• assessment strategies for IPE
• using IPE strategy to address the needs of patients
• guide to IPE
• inter-profession team based learning methods
• impacts of IPE on patient outcomes and collaboration efforts
• effects of IPE on healthcare outcomes and professional practice
• review of IPE effectiveness in health professional programs
• interprofessional collaboration.

Essential Findings from the Literature

The concept of interprofessional education: IPE entails promotion of an integrated approach to education for various health professions (Abu-Rish, Kim, Choe, & Varpio, 2012). IPE stresses interaction-based learning where various professionals aim at improving patient care delivery, and patient outcome practices. The duration, timing and relevance of IPE is important in improving change in behavior among healthcare professionals, while responding to complex needs in healthcare systems, which are becoming increasingly inter-dependent.

Reeves, Perrier, et al. (2013) define interprofessional education as the intervention process in which members who belong to more than one profession learn together with the aim of improving patient well-being and interprofessional collaboration. Individuals are increasingly advocating for IPE because of its contribution to the development of
appropriate knowledge and skills among healthcare providers. Interprofessional collaboration is central to effective and efficient provisions of healthcare in the dynamic environment where patients have a variety of complex needs. Some of the outcomes that scholars have associated with interprofessional collaboration include optimal use of skills among healthcare professionals, increased patient care, safety management, and provision of high quality services (Reeves, Perrier, et al., 2013). Policy makers and educators have devised a shared mission and objectives to promote IPE programs in nursing, medicine and public health sectors. This collaboration is the affirmative product resulting from IPE implementation.

IPE concentrates on using teams from different disciplines, such as nursing, public health, medicine, dentistry, and pharmacy to improve patient outcomes (Reeves, Boet, et al., 2015). This method considers the delivery of quality care to patients, reducing costs, decreasing the rate of errors made, and time patients stay in healthcare facilities. Team based approaches have shown improved patient outcomes in primary care, disease management, chronic pain treatment and surgery (Reeves, Boet, et al., 2015). The Institute of Medicine reported that healthcare errors result from ineffective methods of communication and interprofessional cooperation. The report suggested that interprofessional collaboration is one of the approaches used in reducing errors among patients by 50% in five years (Reeves, Boet, et al., 2015). Additionally, it is presently known that teamwork among various disciplines is a method used for making shared decisions. Patients also participate in making decisions on improving their health outcomes.
IPE is regarded as a central element of professional curricula for undergraduate students. Students participating in interprofessional experiences have been reported to have increased confidence while executing their roles in healthcare teams (Reeves, Boet, et al., 2015). The benefits of IPE include allowing students in various healthcare professions to be well-rounded. Moreover, IPE creates an environment for pursuing common goals, specifically: improving patient outcomes, encouraging active participation in providing quality care for patients, improving problem solving, leadership and communication skills, and increasing the comprehension of other discipline roles by students working in collaboration.

It is expected that health professional school graduates develop key competencies above the use of drugs available for today’s disease treatments (Marken, Zimmerman, Kennedy, Schremmer, & Smith, 2010). These students should utilize evidence-based practices, deliver care centered on patient needs, improve on quality of care, and employ other professions through knowledge collaboration and inclusion of various practice skills to achieve improved patient safety.

**IPE Implementation Outcomes**

Abu-Rish, et al. (2012) sought to determine the current trends in IPE among health sciences students. The review examined both quantitative and qualitative studies on IPE interventions from 2005 to 2010. Individual studies were evaluated using three main criteria: IPE for health professional students, educational intervention and programs emphasizing key IPE competencies, and assessed data that documents learning outcomes or educational experiences among health profession students.

The results for educational interventions and programs were different among the studies reviewed. Forty-seven percent of the studies indicated the utilization of
conceptual and theoretical frameworks while implementing IPE (Abu-Rish, et al., 2012). The studies however provided little description on implementation of both frameworks.

The studies reviewed exposed various formats and strategies used in IPE implementation. The main strategies found were case based learning, large group lectures, direct contact with patients, simulation, use of reflective exercises, large group lectures, clinical teaching, and community based project utilization. Furthermore, 57.8% of the studies indicated to have used small group discussions, 48.2% case based learning, 36.1% for use of lectures, 34.9% for clinical teaching, 34.9% for reflective exercises, 16.9% for community-based projects and 26.5% for use of simulations. (Abu-Rish, et al., 2012). Two main strategies found to be less commonly used include e-learning (15.7%) and shadowing of clinical providers (14.5%).

Abu-Rish, et al. (2012) also reviewed IPE implementation outcomes. The results showed that 80.7% of the studies reviewed, indicated at least one learning outcome. The outcomes reported were as follows: attitudes towards other professions and IPE (77.1%), knowledge of roles and quality of IPE (39.8%), satisfaction (36.1%), skills such as resuscitation (30.1%), patient based outcomes (7.2%), and other outcomes (36.1%). The results also further indicated that the main targets of knowledge were to comprehend collaborative techniques, professional roles and responsibilities, care models, patient or clinical care content, safety of patients, improvement on the quality of service delivered, and cultural competency.

The Abu-Rish, et al. (2012) investigation also included determining the factors that limit or enhance successful implementation of IPE programs. Moreover, 78.3% of the studies highlighted some barriers to the implementation of IPE. The barriers were
highlighted as follows: scheduling (47%), forming compatible levels for students with different background knowledge, clinical knowledge and experience (18.1%), time required for faculty members to prepare (14.5%), inadequate provision of funds (12%), insufficient support from the administrators (7.2%), and lack of role preparation among faculty members (4.8%). Results indicated that the greatest success factor for IPE implementation is administrative support. Furthermore, 38.6% of the studies supported financial support, 14.5% staff support, 9.8% leaders buy-in, 1.2% office space dedicated for IPE and 2.4% technological equipment (Abu-Rish, et al., 2012).

The review provided by Abu-Rish, et al. (2012) is significant to the proposed study because it highlights relevant information to be considered for technical college IPE curriculum design. Specific elements to consider include: course frequency, educational intervention duration, strategies used to teach students, designers to include in intervention development, IPE implementation outcome success factors, and barriers to IPE implementation.

Reeves, Perrier, et al. (2013) conducted a review study to evaluate and compare the effectiveness of IPE and specific profession interventions; and the effectiveness of IPE intervention with and without IPE education. The research used studies dated from 2006 to 2011, including Controlled Before and After (CBA) studies, Randomized Controlled Trials (RCT), and Interrupted Time Series (ITS) on IPE interventions. Seven of the reviewed studies recorded positive IPE intervention outcomes for emergency care department culture, diabetes care, patient satisfaction, emergency department team clinical errors, team member collaboration, core competencies development in patient care service delivery, management care for domestic violence victims, and surgery room
team work (Reeves, Perrier, et al., 2013). Four of the studies gave positive and neutral outcomes, and the remaining four reported no significant effect on patient care and professional practice.

The researchers assessed the studies for potential bias. The risks assessed included a generation of random sequences, allocation concealment, similarity in baseline features, incomplete outcome data, contamination, binding outcome assessment, selective reporting, and interventions that do not affect data. This helped strengthen the results, improving on reliability and transferability. The study was also strengthened by the use of control and intervention groups, which facilitated comparisons of the results (Reeves, Perrier, et al., 2013). The research used a variety of studies from nursing, maintenance staff, nursing assistants, surgeons, surgery technicians, physicians, physiotherapists and anesthesiologists. This makes the study suitable for generalization to other populations or institutions in healthcare professions. Use of current studies (from 2006 to 2011) helped the researchers to access current information and trends in IPE implementation, including interventions encompassing healthcare outcomes.

Reeves, Perrier, et al. (2013) indicated that although most of the studies showed improved positive outcomes in relation to IPE interventions, the 15 studies used were of heterogeneous nature, with limitations in method design used, leading to unclear measurement on IPE effectiveness. There were disparities in research design used, interventions (1-8 hours), and interaction methods (seminars and workshops). The heterogeneity made summarization and categorization of key outcomes difficult. The study had methodological limitations. Comparative studies used did not have the same interventions, making evaluation of IPE outcomes difficult. Other studies had used
smaller samples, even less than 100 healthcare practitioners. This limited the capability of
the analysis to generalize the study to larger populations (Reeves, Perrier, et al., 2013).

What Does the Development of an (IPE) Program Encompass?

Common education outcomes must be created before building a curriculum that
integrates different professions. While developing the IPE curriculum, the developers
must have the same objective. The main goal that calls for IPE curriculum development
is improved patient care outcomes. Additionally, curriculum design and development
efforts may gear towards changing the attitudes, behaviors, and knowledge of students to
attain a specified competency. Integrating educational outcomes from various health
professional programs into one education program require common consensus due to
different agendas brought about by different professions (Kahaleh, Danielson, Franson,
Nuffer, & Umland, 2015).

IPE encompasses designing the curriculum, developing evaluation plans, building
capacity and implementing the education program. The technique used to design and
implement a given IPE curriculum depends on the objectives stipulated. The development
team must highlight the expected outcomes and assessment plans respectively, before
building a curriculum that meet the outcomes agreed upon.

Step 1, IPE Mission: The first step of curriculum design is to establish the IPE mission.
A college that collaborates with other schools or academic center must first establish the
common mission for all the professions and programs involved. It is essential that all
stakeholders achieve a common consensus about a mutual goal. The main mission’s aim
is advancing individual and community health through the integration of transformative
learning experiences, improving the quality of care among targeted populations, reducing
costs incurred in patient care delivery, and providing quality and safe services through collaborative efforts.

**Step 2, Common Philosophy:** The second step of designing a curriculum is determining the underlying common philosophy. The motivation that underlies IPE implementation for an individual program differs with interprofessional programs. The scope of changes proposed on curriculum developed, heavily depends on IPE purposes and perceptions. WHO argues that the main objective of IPE is to enhance improved patient outcomes and safety. Although, other developers may be driven by the need to align decision making regarding patient care with professional practice scope. Hence, developers should recognize and discuss competing intentions.

**Step 3, IPE participant requirements:** The most crucial step is to comprehend the requirements of every participant in IPE programs. Curriculum for each program involved should be reviewed for easy comprehension. There are disparities in the rates at which students from various health professions develop professional identity and competency. Due to the nature of differences in programs offered, there are different rates of developing skills, knowledge and abilities. Therefore, it is important to comprehend the gaps and overlaps among all the professions. The underlying philosophy is appropriate if it prioritizes the practical application of what students learn.

**Step 4, Curriculum assessment and framework:** The last step of designing an IPE curriculum, is building an appropriate curriculum assessment and model framework. Evaluation plans are crucial for directing the quality of improvements and they should be prioritized before implementing IPE framework models.
A common underlying framework when properly determined lays the foundation for curriculum design. The best curriculum is designed when the theoretical and curriculum framework presents a common philosophy. Members who teach IPE have different methodical approaches and use different theories. There are different objectives that inform the use of simulations, didactic coursework, and service learning as teaching techniques because of differences in their underlying theories. Graphs, for instance, can be useful in enabling students and members in faculties to visualize frameworks utilized.

According to Kahaleh, et al. (2015) the most important questions to consider while discussing the framework model include, a) what type of healthcare professionals can be included, b) how will the structure of coursework be, c) how will learning activities take place among students, d) how students will learn the course, e) is available space adequate for accommodating all students, and f) which programs and instructors will be involved in content development? A technical college can implement the best IPE curriculum if it is able to answer all of the above questions.

**Developing a Plan for IPE Assessment**

A comprehensive plan for evaluating an IPE program ensures that the goals, mission and expected educational outcomes are delivered. Evaluation plans are crucial for directing the quality of improvements expected currently, and in the future. Therefore, these evaluation plans should be prioritized before implementing IPE framework models. While developing evaluation plans, it is important to emphasize educational outcomes. A plan developed during IPE curriculum creation ensures that objectives, missions, evaluation tools, and educational outcomes are in line. It is desirable to include all participating professions to achieve common mutual interests. The results of curriculum evaluation are useful in achieving continuous improvements and for accreditation.
purposes. All the participating professions form a committee to assess the IPE program for accountability purposes.

IPE assessment involves thoroughly evaluating activities to be performed by participants (Reeves, Boet, et al., 2015). The main reason for assessment is to judge the usefulness of social and health programs. During evaluation, the assessors conduct change initiatives by addressing specific questions transparently by collecting and analyzing data in a systematic manner. The causes and effects for actions observed are examined during the evaluation process. The assessors may employ qualitative, quantitative techniques, or mixed approaches (Reeves, Boet, et al., 2015).

IPE curriculum developers should evaluate the program from the onset. Individuals responsible for evaluating the curriculum should have background knowledge of learning outcomes, learning contexts, learning levels, learning objectives, teaching or facilitation methods, and a conceptual model that directs IPE design and development (Reeves, Boet, et al., 2015). The evaluators should also include representatives from other professions, learners, some patients if possible, and administrators. Inclusion of all stakeholders helps in providing wide expertise and perspectives regarding evaluation, which results in utilization of effective standard measures.

There are various reasons for IPE evaluations, including comparisons of costs and associated benefits and measuring the influence of new activities or exploration of processes used to facilitate IPE. It is imperative that evaluators have a guiding objective or purpose. They also need adequate time to make decisions on the summative and formative purposes. IPE intentions for improving on existing activities are said to be formative, while intentions for assessing final influence of IPE activities are said to be
summative (Reeves, Boet, et al., 2015). Evaluators should also spend more time while formulating evaluation questions, which act as guidance to originate evaluation planning, giving rise to various results and conclusions.

The aims of evaluation provide the basis for evaluation questions used (Reeves, Boet, et al., 2015). One aim of evaluation may be to provide feedback to educators, commissioners, managers or administrators. The questions that inform this aim should concentrate on local stakeholders, hence the need to comprehend how IPE affects the knowledge, skills, collaborative behavior, and attitudes of IPE learners. If the aim of evaluation is to publish the findings in IPE literature, the main concern should be on quality of knowledge needed to advance on existing IPE literature. Most of evaluative literature has focused on short term and self-assessment interventions in knowledge, along with skills and attitude of collaborative teams (Reeves, Boet, et al., 2015). More scholars should therefore examine sustainable collaboration in working environments, how to improve services offered to patients, and deliveries of quality care for patients.

Considering the learning outcomes are important during the evaluation process. IPE activities should be evaluated to enhance comprehension of expected outcomes. Generally, IPE evaluation concentrates on achieving the needs of all local stakeholders, such as professional institutions, creditors and educators. Evaluation also helps in determining behavior change; institutional change and patient health improvement. The evaluation process requires time and expertise as the main resources (Reeves, Boet, et al., 2015).

Theoretical models are helpful in evaluating IPE programs. Evaluators use theories to comprehend fundamental assumptions, leading to better designs. Theories also help to
generalize the nature of IPE to expected and unexpected influences. Theories are used to explore purpose, nature and contexts critically, which helps in design and implementation of IPE initiatives. Concepts used can be generalized or transferred to other settings. Scholarly literature on social sciences contains various theoretical models useful for evaluating IPE. Use of informed theories provides information on effectiveness, adding knowledge to the existing literature (Reeves, Boet, et al., 2015).

Many scholars have used evaluation models in providing insights into learner outcomes (Reeves, Boet, et al., 2015). Some models may provide IPE utilization, but fail to determine core factors such as comprehending the nature of IPE contexts and exploration of other activities surrounding IPE. Sustaining and replicating the IPE curriculum requires clarification on contexts of teaching and learning activities. For instance, evaluators can collect data on IPE facilitation and execution to improve upon IPE activities, or to analyze programs executed poorly (Reeves, Boet, et al., 2015). The evaluation models used should meet the following criteria: (1) utilize contexts, interventions and related outcomes, and (2) have as a feature, qualitative and quantitative data. The models should also be directed towards understanding presage elements influencing learning or teaching process delivery, and how the processes influence IPE intervention outcomes (Reeves, Boet, et al., 2015).

There exist various assessment tools used for evaluating IPE programs. Various researchers have examined some assessment tools among students in IPE practice programs (Kahaleh, et al., 2015). The Student Perceptions of Physician-Pharmacist Interprofessional Clinical Education (SPICE) is one of the assessment tools used for evaluating the impacts of interprofessional clinic experiences. The tool is useful when
identifying different perceptions of students regarding experiences with IPE (Fike, et al., 2013). This tool is limited since it cannot assess roles and responsibilities required in IPE programs. Another useful tool for IPE program evaluation is Communication and Teamwork Skills (CATS). CATS can be used to assess functions, communication, and leadership aspects that surround professional roles. This tool is useful in Advanced Pharmacy Practice Experiences (APPEs) context (Frankel, Gardner, Maynard & Kelly, 2007).

Most of the current studies that have assessed IPE implementation have concentrated only on the attitudes of students, and how ready they are to incorporate IPE knowledge and key competencies (Kahaleh, et al., 2015). Consequently, there is need for a research study to examine other outcomes such as performance of students and delivery of collaborative care. Comparisons should be made while assessing these factors between students who receive IPE training and those who do not. Using a mixture of evaluation variables will provide evidence of benefits associated with IPE programs in the end. The assessment tools will also help to determine whether students meet key competencies or not, which may necessitate the need for redesigning IPE curriculum for improving healthcare outcomes.

This study strives to develop an assessment plan that can be used to evaluate IPE programs, specifically considering key competencies that each participating professionals should gain and the required extent expected. This includes cross-referencing various IPE curriculums developed, IPE programs, how the key competencies have been addressed for each program, and assessment tools that have been used in measuring programs among individual students and collectively. For instance, The University of Colorado has
utilized the Comprehensive Assessment of Team Member Effectiveness (CATME) tool to assess the behavior and effectiveness of members in a team, both at individual and peer levels (Ohland, et al., 2012). The tool is helpful in providing information on student performance in various clinical interprofessional contexts (Kahaleh, et al., 2015). We plan to modify this tool for use in this study.

**Methods for Implementing IPE Interventions**

A variety of strategies and intervention are used to implement a comprehensive IPE curriculum. The suitable IPE program incorporations student comprehension in parallel with relevant learning experiences. The structure of the curriculum, pre-clinical requirements, and culture should be designed in reflection of best approaches.

Previously, healthcare professionals received training at individual levels, as required by traditional professional programs (Kahaleh, et al., 2015). Ultimately, this can lead to professionals operating independently in clinical settings without understanding the contributions made by each member towards patient care. It is highly expected that teams in the healthcare environment collaborate to improve on patients’ welfare. Patients suffer when the healthcare system fails to meet improved health outcomes. In this context, students should be made aware of such information on the onset of IPE programs. Clinical context, when provided to students, subjects them to the real environment of healthcare, with basic knowledge on interprofessional collaboration domains.

Incorporation of ethical standards into IPE programs is one of the pre-clinical interventions. Professional development and ethics are fundamentals taught in early stages. Instead of developing the curriculum with ethics as a separate coursework, this content can be integrated into IPE programs. The University of Colorado includes ethical
considerations in a general interprofessional education course to its health professional students (Kahaleh, et al., 2015). The students are taught the importance of collaboration among healthcare professionals, and techniques to encourage teamwork efforts. Additionally, students from various professions participate in a series of small group discussions, therefore reinforcing collaborated efforts throughout the program, so that they are acquainted to each other by creating meaningful positive personal and educational relationships.

Instructors can address roles and responsibilities of healthcare professionals in early stages of IPE programs as a pre-clinical intervention. A study by Van Winkle, et al. (2012) investigated perceptions of roles and responsibilities of professionals in providing patient care using workshops. In the study, change in collaboration score was measured before and after using collaboration between medical and pharmacy students. The study involved a total of 215 pharmacy students, and 205 medical students. The results of the study indicated that workshops are helpful in fostering collaboration among healthcare professionals. The collaboration score for pharmacy students raised to above the baseline (p=0.02) while medical student scores increased specifically for the education component (p=0.015) (Van Winkle, et al., 2012). The collaboration scores for pharmacy students were significantly higher than those for medical students (p<0.0001).

According to Van Winkle, et al. (2012) this was the first study to investigate and determine the correlation between interprofessional collaboration and empathy scores in medical and pharmacy students. These two important measures of the healthcare profession are mutually dependent upon one another. When education efforts are geared towards one of the variables, the other may also be promoted.
Although the study used three occasions for survey instrument, Scale of Attitudes toward Physician-Pharmacist Collaboration, the results were for one institution, which limits generalization of the results. On the same note, randomly assigned groups were not included in the study (Van Winkle, et al., 2012). The baseline was established through four and five month phases used to conduct the workshop. Changes in scores on the surveys are due to workshops increased beyond the baseline for medical and pharmacy students.

Additional limitations include the period of time for completing the survey which, for pharmacy students, was fourteen days before and after the workshop. On the other hand, time for medical students was only nine days. The matriculation period for medical students was one month earlier than that for pharmacy students (Van Winkle, et al., 2012). The difference in time may have influenced the results, accounting for some of the variances observed. There were also additional courses in every program curriculum, which might have affected the scores of collaborations.

The proposed study was designed to develop a curriculum for more than one profession in more than one institution. Because of this larger scope, it is easier to generalize the results to other institutions and programs. The study also used random study groups, which were used for comparison purposes. Random selection of group participants or using others as a control group make the research more reliable with little room for bias (Maxwell, 2013). The study also ensured that the matriculation period for all the profession groups involved was the same, to limit interference with the results. The study did not consider how the results may be impacted by additional and varied coursework for each program of study.
Interprofessional communication is useful for implementing IPE interventions. Effective communication ensures successful IPE program implementation (Kahaleh, et al., 2015). Marken, et al. (2010) conducted a study to determine the effectiveness of using simulation as a communication tool to help interprofessional healthcare teams engage in difficult education with patients. An inter-disciplinary team of student nurses, pharmacy residents and students, and medical residents were used to collect data for the study. The researchers assessed positive learning techniques and how to design better future programs useful for student learning. The results of the study indicated that simulation is an effective method of communication to teach healthcare professionals to engage in difficult conversations with patients. The study was limited since there were inadequate resources available because all students in each program were not utilized making for a small sample size of each program. This study indicates that result outcomes can be improved by determining other methods of communication useful for implementing IPE interventions.

Teams can carry out activities aimed at improving healthcare outcomes. Simulation is one of the techniques used to model behavior for appropriate collaborative teams. Simulation involves using computerized models, which represent the human physiological processes, various disease states, actors playing dedicated roles and real medical practitioners able to model both positive and negative characteristics in the simulated surrounding (Marken, et al., 2010). Students who learn using simulations can apply their practice skills in an environment with reduced risks. Students are able to interact with models, in the same manner they would interact with patients, providing opportunities for learning practical and core skills before dealing with real human beings.
Students can also develop core competencies in APPE areas (Marken, et al., 2010). Students are able to cope with difficult circumstances such as anger, intrusion due to personal questions, and delivering despondent news to patients. Simulations can be used to teach interprofessional teams the scope of various professions, sharing and collaborating to enhance positive patient healthcare outcomes.

Simulations have been used in various professional environments, and found to facilitate the development of physical assessment skills, communication skills, assessment and primary care skills (Marken, et al., 2010). The University of Washington Center for Health Sciences Interprofessional Education, Research, and Practice used teams of pharmacy, medicine, social work, dentistry and nursing students to examine interprofessional collaboration (Odegard, et al., 2009). They found that collaboration enables the team members to advocate for the rights of the patients, manage or resolve conflicts, assume their responsibilities, exhibit leadership qualities and speak up against a power gradient (Odegard, et al., 2009). This investigation demonstrates the importance of including teamwork facilitation in IPE interventions.

The Marken, et al. (2010) study was successful in assessing a multiplicity of student measures, including satisfaction, knowledge, and skill gain. Most of the faculty members applied the design and implementation process, and the participants gave affirmative reactions, making the study well-built and successful. Few studies have investigated IPE research using theoretical frameworks. This study succeeded in using Conscious Competence model, which was used as a theoretical framework to guide the study. The conscious competence theory and related matrix model explain the process and stages of learning a new skill (or behavior, ability, technique, etc.). This model
remains fundamentally a very simple and helpful explanation of how we learn, and also serves as a useful reminder of the need to train people in stages.

Even though improvements were recorded among the majority of the participants, the study failed to achieve the goal of participants moving one level above on Conscious Competence Learning Matrix used (Marken, et al., 2010). In the study, the central measure was self-rated, instead of performing evaluations by a faculty member, the results on competency at the baseline were not clear. Designing the simulation program was challenging for this study. Some design team members had experience in simulation and modeling, but lacked experience using simulations in any given interprofessional environment. The team was forced to use outside expertise. There was also no theoretical framework useful for modeling the study. The development team was forced to examine more literature that could provide relevant theoretical framework, and this process consumed a lot of time. Most of the major challenges encountered during this study slowed the IPE implementation process (Marken, et al., 2010).

The proposed study considered this complication and provided room for evaluation of IPE curriculum by patients, faculty members, and professions from various healthcare disciplines. This helped to establish a clear baseline for key competency. The designers of this new curriculum for the technical college had experience in simulation and modeling, with IPE experience. The developers also used theoretical frameworks to guide the study while implementing the IPE curriculum.

Simulations have been used as a form of providing IPE to students in various health professions for a long time. According to Bolesta and Chmil (2014) human patient simulation gained its usefulness in the last decade, and is used in nursing curriculum as
an effective method of providing opportunities for development of clinical judgments among nursing students. Human patient simulation has also been tested in other curriculum professions like pharmacy. Researchers have reported some positive impacts of simulation to learning experience of the students. Human patient simulation has been reported to help in teaching collaboration, patient safety, communication, and providing opportunities for utilization of technology to enhance IPE learning experience among students from diverse health professions (Bolesta & Chmil, 2014).

Bolesta and Chmil (2014) investigated how human patient simulation can be used to plan, implement, and measure the outcomes of IPE in clinical laboratories. Nursing and pharmacy students used a simulator of heart failure condition to assume clinical roles that involve learning and collaboration. After evaluation, the results of the study indicated that readiness and the attitude of students to participate in interprofessional interaction improved. Content of clinical knowledge, clinical skills, communication skills, leadership skills, along with professional attitude and decision making skills were used as measures of IPE before and after participation in simulation. In this study, it was revealed that students benefited most from improved communication skills (Bolesta & Chmil, 2014). The authors concluded that there is improved student ability and attitude to participate in IPE collaborative activities after students participated in IPE curricular activities.

The study by Bolesta and Chmil (2014) was successful in integrating IPE experiences into the pharmacy and nursing curricula. The simulation used provided an opportunity to develop IPE implementation experiences for both pharmacists and nurses, increasing student exposure to the simulation. Coordinating students from more than one profession is one of the barriers in IPE curriculum development and implementation. The
study overcame this barrier by encouraging collaboration among faculty members in identifying favorable courses that the IPE curriculum could be included for both nursing and pharmacy professions to facilitate human patient simulation. This ensured originality in clinical laboratory courses for both professions. Facilitators worked in groups, ensuring that students completed the assigned laboratory sections with a single patient simulator.

Unfortunately, results revealed that the Bolesta and Chmil (2014) study was not conclusive on learning outcomes among students and changes introduced in practical programs. The authors failed to assess the effects of IPE experiences on learning outcomes among students, which could have been central in the determination of further integration of the learning effects in the IPE curriculum. The study assessed student outcomes using student perceptions and attitudes only. Using an Objective Structured Clinical Examination (OSCE) tool might have provided evidence supporting the impacts of IPE on learning outcomes. Bolesta and Chmil (2014) also failed to provide students with preparations required for IPE elements in curriculum innovation. It was not possible to determine whether the course initiative contributed to skills and knowledge gained during the simulation experiment. If this effect would have been assessed, other factors to the clinical practice could have been confounded. Conducting the evaluation could have helped account for attitudes, knowledge and skills gained before the IPE experience and after the IPE experience. The small number of nurses who participated limits the study results and extrapolation of the findings. It is critical to assess IPE effects on learning outcomes among students as health disciplines continue to evolve.
Clinical interventions influence communication, roles, responsibilities, and teamwork (Kahaleh, et al., 2015). Incorporation of students in interprofessional healthcare situations largely affect the perception of students on roles and responsibilities required. Maldonado, et al. (2013) conducted a survey among pharmacy students to determine the effects of participation in organ transplant on interprofessional roles. Students from the United States took part in an APPE regarding organ transplant. The students provided both pre and post-APPE survey responses on communication, interprofessional roles, and teamwork. The results of the study showed a positive increase in interprofessionalism scores, from 17 to 22 (Maldonado, et al., 2013).

Positive changes were recorded in key role and responsibility competencies, team building, teamwork, and interprofessional communication. The highest scores were for comprehension of the scope required for professionals and development of comfortable working relationships with colleagues. During the study, the researchers noted that 89% of the participants who completed the surveys had previously participated in clinical or pre-clinical interprofessional experiences. The authors concluded that participation of students in IP clinical interventions enhances positive professional development, preparing them for teamwork. The described research study can use the investigation by Maldonado, et al. (2013) to recommend improvements essential to collaboration, communication, effective team performance, increase comprehension of other professions and knowledge required to be accordant with dynamic roles required in teams.

The Maldonado, et al. (2013) survey study was successful in using a transplantation clinical arena, which contains teams from different disciplines. The study
also used the four central competencies; roles and responsibilities, values and ethics, team and teamwork, and interprofessional collaboration. The authors provided a comprehensive background that laid a foundation for translating the core competencies mentioned in the classroom setting to clinical practice (Maldonado, et al., 2013). Another strength of this study is generalization of the results to larger populations. Even though the focus of the study was on a clinical APPE arena, the questions used in the survey instruments were structured such that they focused on dynamics of teams from multiple disciplines.

Incorporating IPE in health profession education can take place in classroom curriculum, pre-clinical, and clinical APPE settings. The Maldonado, et al. (2013) study was limited to one setting; clinical APPE. The study utilized a response rate of 59% for both pre and post surveys performed among students, exposing the study to further limitations because response ratio does not meet the anticipated threshold, and might be one of the possible reasons for errors in the study. The response rate raises the concern of whether the results are reliable (Maxwell, 2013).

**Capacity Building for IPE Implementation**

There are IPE accomplishment challenges such as scheduling, time availability, and development of faculty members that affect collaboration of members from diverse professions. There are vital questions that must act as a lead to design and develop IPE content for delivery. According to Kahaleh, et al. (2013) core capacity questions that must be answered include: a) what is the number of students that the IPE program can accommodate, b) what are the respective ratios of students from various professions, c) what is the number of available faculty members, d) how much time can faculty members devote to teaching, e) are the faculty members ready to accommodate members from
different professions, f) what facilities are available for training e.g. clinical training sites, learning rooms etc., g) what interactions are available for team based learning? In addition, what types of interactions are students expected to have?

Logistical scheduling is one of the capacity building initiatives. It is very challenging to schedule logistics spanning multiple profession schools. It is difficult to convince members and push for changes in individual professional programs so that students can interact one on one. However, healthcare professionals can corroborate to ensure that the IPE curriculum developed is effective. It is imperative that developers schedule limited programs at the beginning phases allowing time for improvements in cases of logistic problems. Expecting students from all professions to participate may delay execution of IPE activities.

The University of Colorado had various logistic implementation challenges in relation to IPE programs (Kahaleh, et al., 2013). Members of the faculty had a common unanimity on the contributions to be made by each profession, but there was no collective understanding of which programs at the university to utilize. There was also a conflict because of differing schedules provided for each profession. Another challenge was disparities in terms of the number of academic years required for program completion and experiences gained. Supervision was required for engaging students in different activities. To address these problems, faculty members had to establish a common vision for all professions, identify required educational outcomes to ensure student participation, and determine the capacity of how each program could accommodate solutions to the challenges highlighted (Kahaleh, et al., 2013). It is imperative that challenges are considered while implementing capacity-building initiatives necessary for IPE programs.
Faculty development is another factor considered while building volume for IPE implementation. The act of mixing together individuals from multiple professions in one large cohort, does not guarantee the making of common decisions and collaboration. Available organizational facilities must provide opportunities for vigorous learning where there are numerous clinical intervention practices and group discussions that enhance formation of relationships necessary for collaboration. Most institutions do not have adequate facilities for practicing IPE initiatives. Therefore, curriculum developers must circumspectly plan for physical facilities to ensure that the space provided for learning aligns with the curriculum designed (Kahaleh, et al., 2013).

Faculty development is a crucial component for building capacity and teaching key competencies required in IPE (Abu-Rish, et al., 2012). Faculty members without proper training in IPE lack sufficient preparation for developing or facilitating student discussions, and bringing different perspectives from various disciplines. Administrators must be committed to IPE faculty development to enhance collaboration. Various approaches reported to enhance IPE faculty development include use of theologians, education specialists, cultural advisors, and inclusion of families, students, and patients in content development (Abu-Rish, et al., 2012).

Apart from providing opportunities for students to learn, faculty members need training regarding the scope of their practice and what differentiates their respective professions. Students can add value to their expertise if faculty members provide valuable education and practice (Kahaleh, et al., 2013). It is very challenging to achieve clear communication among members from diverse professions. Designing of the curriculum requires more time and labor, specifically in cases involving more than one profession.
Some of the professions are likely to disagree with clinical interventions and educational outcomes. Hence, training is essential to reinforce trust among members from diverse professions. Faculty members who plan to teach IPE curriculum should be provided enough time to get acquainted with each other and plan for collaborative teaching to make learning coherent and relevant for students from various professions (Kahaleh, et al., 2013).

Special faculty development is chief for anticipating and dealing with complicated situations arising from students across different disciplines (Kahaleh, et al., 2013). Members of the faculties must be equipped with teaching skills such as debriefing, facilitating, conflict management, diffusing and discussion of power gradients; these skills are not traditionally taught in various professions. Faculty development helps put in order the teaching teams, and enhances development of buoyancy while using pioneering teaching techniques, giving students different perspectives. Preceptor development is valuable as it helps model the clinical teaching setting, and assists in allowing for a conducive atmosphere for conflict resolution and teamwork. Curriculum developers should perform appraisal for preceptor training and faculty training to boost conducive learning know-how (Kahaleh, et al., 2013).

**Effects of Implementing IPE**

Several scholars have reported positive attitudes among students and faculty members on professional collaboration in various health professional programs (Lash, et al., 2014). Some medical students have been reported to be skeptic about IPE implementation. To engage students in IPE programs effectively, all the stakeholders in medicine must play their diverse roles. All IPE programs have potential benefits and risks associated with its implementation.
Lash, et al. (2014) conducted a research survey to determine the major benefits and risks of IPE among faculty members from different disciplines. Faculty members were provided with questionnaires to give their different perceptions on IPE implementation. The participants provided their feedback on the following benefits of IPE: IPE helps resolve future conflicts in case of treatment option disagreements, enables students to determine the limitations of their roles in the healthcare provision, improves patient care efficiency, results in increased patient outcomes, and leads to improved learning among team members. The results indicated that most of the participants agree on the merits of IPE in improving patient care outcomes, hence supporting that IPE implementation was feasible (Lash, et al., 2014). It was indicated that IPE leads to improved care efficiency ($p=0.001$) and enhances learning as a team ($p=0.001$).

Examination of studies ranging from quantitative, qualitative and mixed methods by Lash, et al. (2012) strengthened the study. The review highlighted innovative techniques to IPE implementation, and suggested methodologies that can help improve IPE research. The study also indicated that failure to describe the variables used in measuring educational outcomes explicitly limits conclusions made on best educational practices and strategies. The review described findings from recent scholars (2005 to 2010) that have broadly investigated health professional literature on IPE (Lash, et al., 2012). Major recommendations provided, advocated for consistency in reporting IPE results. This helps in contributing to IPE knowledge that is evolving and expanding depending on techniques used, strategies employed, and educational outcomes. Present knowledge in IPE research enhances competency preparation among interprofessional trainees.
The study by Lash, et al. (2014) was limited by the rate of responses provided (only 60%, hence the need for a larger participation rate), some potential bias in the result, and use of three programs in the same university affecting applicability of the results to other geographical locations or institutions. The programs from nursing, dentistry and nutrition were not included hence limited programs used.

**Gaps in Current Literature**

There are very few theoretical frameworks in IPE, leading to disjoint between theories in education and practical applicability. As such, the major concern raised is how to improve IPE interventions in the future to enhance implementation of IPE theoretical models. Lash, et al. (2012) argues that theoretical and conceptual frameworks should be used as a basis for IPE programs. When more details on theoretical and conceptual frameworks are provided, teaching techniques, study research objectives and educational outcomes can be properly evaluated.

The three main theories used in supporting Theoretical and Conceptual frameworks include Organizational Theory, Activity Theory, and Complexity Theory. Organizational Theory is relevant to this study because it provided the context of learning for the healthcare practitioners (Barr, 2013). Complexity Theory (Plsek & Greenhalgh, 2001), is useful in providing the complex context of healthcare system, giving rise to the utilization of methods that incorporate a wide range of components that interact in IPE curriculum developed. Activity Theory deals with interventions (Engestrom, 2004). This theory is useful in determining interventions required in IPE curriculum developed for the college students.

Another gap in the current literature is contradictory stipulation of descriptions with regard to populations, study settings and educational outcomes. Lack of evenness is
a major weakness acknowledged in most scholarly research on IPE. Most of the studies fail to fully describe essential components such as participants, implementation techniques, and variables for measuring the outcomes. As such, researchers in IPE programs have not implemented most of the recommendations given by scholars in previous studies. When key details on research components are provided, IPE scholars are better informed to explore key research questions (Lash, et al., 2012).

This case study provided adequate description of IPE curriculum development and implementation procedures, in addition to IPE outcomes. The study also explored one research question, whose related literature provided current information on IPE exploration ranging from design to implementation outcomes. The related literature provided insights into essential elements required for implementing the IPE curriculum, and enhancing improved student outcomes.

**Issues of Relevance to the Implementation of IPE in a Community College Setting**

IPE’s major problem lies in the fact that apart from evolving and pushing back endless boundaries of knowledge and new ideas, the domain is not well structured to suit the diverse needs of smaller colleges, and select healthcare practitioners. The tremendous scope, proliferation, and upsurge of scientific reports in this domain have not progressed to meet the ever changing needs for current practice. It is not easy to develop and sustain IPE activities because in the past, each healthcare profession considered themselves to be an unique entity within the healthcare profession. IPE introduces the fact that these professions can no longer think of themselves as individual components in delivering healthcare, but must collaborate together to become an unwavering entity as one to maximize each other’s strengths in patient care. The main question of this study was to determine the effectiveness of IPE, and whether students and clinical professionals within
the healthcare organizations as a whole, benefit from using IPE before recommending the use of IPE curriculum implementation into programs in colleges.

**Study Design Choice**

This case study used methods to determine what IPE development encompasses, and its outcomes when implementing the IPE curriculum into a small technical college. The study’s design was appropriate for the size of the collection of participants representing a health discipline within a specific profession and division. A case study of mixed methodology including quantitative data was appropriate for this study to show the participants’ understandings through increased scores in subject content as a result of IPE development and outcomes due to its implementation in this particular college. The way in which the concluding data was obtained is easy to manipulate, analyze, and generalize to a larger population of participants if anticipated as outlined by Cooper & Schindler (2011).

This study attempted to determine what encompasses IPE development and implementation outcomes. The study used overall testing and practical exam scores to capture the experiences of retaining information in the participants, while also gauging their anticipated learning outcomes. It determined the effectiveness of IPE among healthcare professionals in delivering care for the patients within didactic, simulated, and clinical settings. Specifically, the study was designed to measure participant’s outcomes with their experience in an IPE curriculum, and possible related outcomes measuring its effectiveness or ineffectiveness.

The study reviewed current and related literature on interprofessional education, effectiveness of IPE as an innovative strategy, development and implementation of IPE, and evaluation of IPE initiatives. The current literature reviewed gave insights into
research that explored IPE program development, implementation and learning outcomes. By exploring a variety of perceptions and lived experiences in specific groups of healthcare professional students, the study contributed to the body of empirical inquiry, thus enhancing the practicality of the results. The study was looking for main emerging themes which evolved in IPE implementation based on the elements which were introduced into health sciences curriculum.

**Practical Feasibility**

Healthcare education requires active learning, critical thinking and collaboration among professionals. IPE is one of the mechanisms useful for enhancing teamwork. The main purpose of this case study was to determine what IPE encompasses, the outcomes of implementing IPE in college curricula and how feasible it is to use IPE to enhance collaboration among healthcare professionals. To achieve this goal, the study reviewed current literature on IPE, its outcomes and effectiveness. Additionally, the examiner also used quantitative data, such as practical scenario testing scores along with program exams, and clinical competencies collected from student participants to determine IPE effectiveness. The results were collected after the participants completed the program, and were compared to previous scoring in the exact courses prior to when IPE had not been executed. Therefore, a conceptual framework of the case study design was used to identify the experiences in testing results, and clinical application of students with the evolving knowledge regarding IPE implementation. Collection of specific scoring was used to collect data on evidence supporting outcomes related to IPE implementation in college curricula.
Importance of using IPE in Community Colleges

In the present-day, patients have a diversity of needs which are complex in nature implying that their health status requires the attention of more than one discipline. It is evident that meeting the complex needs and challenges of patients will be greatly improved through enhanced communication and collaboration. Many countries have recognized the need for deploying healthcare personnel to address complex problems experienced in families, individual people and communities, through collaboration. IPE is one of the approaches that provide opportunities for professionals to share their expertise, which aims at improving health outcomes of the patients. Collaboration is beneficial as it leads to mutual relationships between professionals, and helps in exploring integrative ways of enhancing improved delivery of patient safety, service delivery and quality of care. This study is significant as it addresses the effectiveness of IPE to support these assertions.

This study is significant for colleges that use IPE programs, or have the intent of doing so in their forthcoming curriculum. Evidence presented can be used to make improvements in the existing IPE programs to enhance student-learning experiences. Those colleges that have not yet integrated IPE programs in their curriculum can use information provided in the study to decide on whether to develop and introduce IPE into their health sciences programs.

This study is also beneficial to healthcare practitioners and those who are affected by the incursion of students into healthcare professions. The study explores effectiveness of IPE in various medical areas. The literature reviewed can lead to increased knowledge among those who are in a healthcare discipline. They can acquire and apply knowledge and skills that are required for collaborative practices. It also indicates the contribution
level of healthcare practitioners in enhancing improved health outcomes as a result of IPE.

The study is significant to policy makers in the health sector. By providing evidence that highlights the successful implementation of IPE in different settings, the study sets the basis for increased advocacy in improving health outcomes. Policy makers can exercise the information provided in the study to formulate policies regarding IPE curricula development in colleges and universities.

**Conceptual/Theoretical and Analysis Framework**

The theoretical frameworks relevant to this study draws from Organizational Theory, Activity Theory, and Complexity Theory. These theories are used in this study to help comprehend adult learning processes and different learning contexts.

**Organizational Theory:** Organizational theory entails an organizational learning culture, in which people must expand on their abilities to create better outcomes as desired, emerging and expansive techniques of thinking and nurturing opportunities created for free collective aspirations among people to learn collectively (Barr, 2013). Members embrace the tradition of equality in the organization through continued efforts of encouraging innovation, proactivity and embracing change after acquiring new information. People pay reverence to the diverse roles, expertise and experiences of each other, considering them as invaluable resources. Members integrate their collective bargaining capacity to respond to diverse learning needs, placing value on mutual benefits from learning experiences and recognizing their own limitations.

Organizational learning is based on double loop learning; meaning that team members with committed actions and proper coordination are able to give flexible responses in the dynamic environment of learning (Barr, 2013). This is contrary to single
loop learning where an individual enhances his learning and progress to remain competitive with other people. Due to the development of new attitudes, beliefs, values, and behavioral patterns, people are motivated to embrace change.

Organizational theory is relevant to this study because it provides the context of learning for the health sciences students in this investigation. The study was meant to determine what necessitates IPE development and implementation outcomes. As a theoretical framework, the organizational theory provided the basis to comprehend how healthcare practitioners can embrace teamwork and collaboration by cultivating a learning culture (Barr, 2013).

**Complexity Theory:** Complexity theory is founded on complex adaptive systems providing a framework for responding to informational, organizational, educational and professional challenges in current healthcare positions (Plsek & Greenhalgh, 2001). Most of the unpredictable complex systems can be processed using this theory. Given that the linearity and rational deduction techniques are insufficient, complex challenges can only be solved by employing multiple solutions.

Healthcare is a very complex system. Complexity Theory deals with changes in the behavior of different systems. Systems are said to be complex if they have numerous components that interact continuously and are subject to change. This definition corresponds with the IPE conception. The interactions emphasized within healthcare collaboration are emphasized instead of the individual components. Complexity Theory gives insight into professional education that is continuously drifting from individual to collective learning. It also depicts the learning process where individuals respond to health team members, education skills, the environment, and healthcare system. This
theory helps to alter the perception from the linear view of education systems, which fails to emphasize collaborative interactions, which in turn, delineates the processes which are not influenced by personal and social factors (Plsek & Greenhalgh, 2001).

Professional education must enhance development of key competencies and capabilities, adaptation to the dynamic changes, continued growth and development, innovation using new knowledge and focus on flexible goals (Plsek & Greenhalgh, 2001). The process of learning occurs in a complex environment which may be familiar or unfamiliar to people. Applying Complexity Theory to IPE lays the foundation of prioritizing learning skills that promote survival and adaptation for the healthcare professionals. Collective learning generates trust and common agreements, which are basics to the formation of meaningful interprofessional relationships.

Activity Theory: Activity Theory was developed by Engestrom (2001). The theory seeks for the comprehension and interventions needed for initiating changes in relations among persons, professions and agencies. This theory provides a bridge for relationships existing at the lowest level; objects, subjects and their relationships. The framework provides the foundation, in the form of a triangle to help comprehend activities at the macro level in communities and organizations. The triangle consists of subject, object and mediating artifact (Figure 1). It gives the focus of specialization and rules applicable in organizations and communities. The theory emphasizes joint activity at the expense of individual activity. To remain adaptive to different forces of change, people should be motivated to work jointly. This theory is applicable in IPE to analyze organizational and multilevel personal collaboration.
Figure 1: A triangle depicts how the learner masters an object by interacting with a mediating artifact, such as language.

Conceptual Framework: Personal factors such as trust, cooperation, flexibility, communication skills, and perception on interprofessional collaboration influence IPE. Additionally, there exist situational factors such as support structures, empowerment and leadership that influence IPE. The mentioned factors were considered as the antecedents in the conceptual framework.

Interprofessional education results in various outcomes. IPE may lead to different attitudes and behaviors to individuals and teams. At a personal level, the IPE outcomes may influence people to stay at their current place of employment if there is increased job satisfaction. The IPE outcomes also affect effectiveness and conflict among team members. The IPE outcomes also influence patient and organizational outcomes.

Scope of the Study

This study explores IPE as a current phenomenon useful for enhancing collaboration among healthcare professionals in all disciplines. Literature reviewed includes what is entailed in IPE, and the outcomes of implementing IPE in college curriculums. The study determined the effectiveness of IPE in the following disciplines: medicine, dentistry, physical therapy, nutrition, nursing, and social work.
The description of the case study displayed steps taken in the development, approval, and implementation of specific interprofessional philosophies and models within one health sciences program at a technical college. The study illustrated how to involve faculty from other professions within the health sciences division, and utilize their knowledge and proficiency in their specific profession to help build a strong collaborative interprofessional curriculum. The study also presented the positive outcomes of such a curriculum by comparing specific program students before the IPE curriculum was introduced and after it was introduced. The results were compared with student group statistical data (mean) of testing and overall class scores.

**Limitations:**

The study did not have a formal tool for assessing the quality of articles used in the literature review. The main goal was to examine and capture the variety of knowledge on IPE using various scholarly articles reporting IPE activities, curriculum development and implementation, and educational outcomes. Quality assessment of the scholarly articles would have led to beneficial patterns in core results provided. It is believed that the approach employed in this study compliments most of the scholarly reviews of high quality standards.

The study focused on group statistical data within a specific healthcare cohort of students only. This was because of the need to determine the evolving knowledge regarding IPE development and implementation practices in college curriculum. Limiting the study to an individual cohort of participants, instead of conducting a random sampling, kept the study within the boundaries of the specified scope.
The study does not include patients. This implies that the study may fail to indicate IPE outcomes from patient perspectives. The views given are limited since they depend on statistical data of the specified healthcare students as the only participant.
Chapter 3: Development, Implementation, and Results

Development

The development and implementation of an interprofessional activity, or an even broader interprofessional education (IPE) model would be an absolute advantage to enhancing the collaboration between healthcare students in escalating their objective to deliver patient-centered quality care (Cerra, & Brandt, 2011). The conception of introducing such a mainstream curriculum in healthcare education by endorsing the collaboration between our six programs within our Health Sciences Division include: Nursing, Radiologic Sciences, Physical Therapy Assistant, Medical Assistant, Massage Therapy, and Surgical Technologist.

The implementation of such a curriculum would involve thorough development, a possible trial and error time frame, and provisions to maximize its potential with the fundamental complexity of undertaking said task into consideration. Furthermore, the execution of introducing a interprofessional activity or model would help format the curriculum in such a way as to aid students in using their educational resources to better develop improved teamwork skills, and improve an understanding of each healthcare profession as a whole. Therefore, this interprofessional process will strengthen and accelerate the learning progression of the student in realizing that each healthcare discipline can greatly benefit by working together in meeting the ever increasing needs of today’s patient.

The first process in the conceptual structure of developing such a collaborative curriculum was to concentrate on one discipline offered within our Health Sciences
Division that I was most accomplished in. My knowledge within the profession of Radiography ensured a range of over 22 years, and for that reason, the Radiologic Sciences Program was selected as the recipient for the introduction of the first IPE activity. The idea of an IPE activity, with the concept of development and implementation was first presented to immediate faculty members who would be involved in the IPE process representing the healthcare fields revealed above within our division. These faculty members either instructed within the designated program, or would be involved in conveying the IPE content of their specific discipline into the curriculum of the chosen program. Teamwork is essential in the development and introduction of an interprofessional activity within an existing curriculum, but is a risk that must be taken within the division if we expect our students to excel in their identifiable profession.

The collaboration with other health sciences disciplines including Massage Therapy, Nursing, Physical Therapy Assistant, and Surgical Technology was quite involved, and encompassed several meetings to create an understanding, enthusiasm, and a buy-in from affected faculty. The indication was to illustrate how IPE and coordination among disciplines would conclusively effect patient management because of increased specialization of tasks, the increased complexity and risks associated with current treatments, and the need to ensure appropriate healthcare outcomes in sustaining patient well-being. After the conceptual framework was presented and understood by those faculty participating, the IPE activity was agreed upon.

After approval by the faculty team involved in the IPE activity, the concept was presented to the Curriculum Committee within the Health Sciences Division. This
committee consists of the Dean for the Division of Health Sciences and selected faculty from each discipline within the division. The concept was presented with the idea that one discipline within the division would be incorporated into the existing curriculum of the selected Radiologic Sciences Program. The design was to introduce the IPE activity into Radiologic Sciences without altering the credit hours within the program. Meaning, the IPE discipline would be introduced to the Radiologic Sciences Program without increasing or decreasing the credit hours of the specific course where the IPE activity will be incorporated, but would also have no effect on the total number of credits contained by the Radiologic Program. The main subject matter of presenting the idea to the Curriculum Committee was to demonstrate that faculty and student teams collaborating together in high-risk and high-intensity curriculum disciplines have greater output, and fewer mistakes than individuals working independently within their discipline, thus preventing medical errors which are the result of dysfunctional or nonexistent teamwork. This focus was imperative to develop and implement a direction towards IPE that teaches and promotes teamwork within medical education.

The IPE activity development and implementation was approved by the Curriculum Committee, and the conceptual framework for the introduction of a second health sciences discipline into the existing Radiologic Sciences Program was conceived. If we as instructors expect our students to “think outside the box” when applying their profession to ultimately improve patient care, then the faculty also needs to “think outside the box” when developing creative ways for their students to acquire information. Faculty need to utilize all the resources available to them, including other healthcare disciplines within their organization.
After research of all the health sciences professions, the most promising and logical choice for introduction into the Radiology curriculum was the Massage Therapy Program. The decision was made because it was noted that the Radiology profession is such a “hands-on” discipline based on the need for palpitation of bony landmarks on patients during radiographic exams to ensure optimal radiographic images.

The faculty of the Massage Therapy Program would introduce basic concepts of entering a patient’s “personal space” or domain in a skilled and relaxed manner, and also the proper technique of patient palpitation during a radiographic procedure. The radiographer has contact with the patient during the majority of any diagnostic radiography exam, and that contact requires specific skills incorporated from the massage discipline to uphold peak student performance while having interaction with a patient. Therefore, the conceptual notion was in making the experience more contented for the Radiology student while in turn, increasing scores on the student’s practical/scenario exams during the first segment of the introduction of IPE. This knowledge based concept would encourage students to incorporate the necessity of understanding facts, concepts, relations, and underlying foundations that team members must integrate in performing a specific task within the IPE scope of practice. Moreover, by employing this task, it in turn promotes proper positioning, palpitation, and positioning techniques acquired through massage, therefore decreasing the possibility of repeating the radiographic images, which will diminish exposing the patient to needless radiation.

After these parameters were discussed and put into place, the foundation framework for this case study and the development of the first introduction of an IPE activity was established for implementation into the Radiologic Sciences Program.
Implementation of Phase One (Massage Therapy)

In order for the implementation phase of IPE to be successful, the instructors involved must possess skills, experience, and confidence to meet the demands in facilitating an IPE course without differing opinions of superiority, and recognize what each individual healthcare profession can offer to that IPE activity and strive to work collaboratively to illustrate how each discipline can offer equal value in promoting one IPE course (Sargeant, 2009).

The Radiology students were strong in the area of identifying patient anatomy, but showed weakness in the proper way of touching a patient to find specific bony anatomy. The faculty of the Radiology program and the Massage Therapy program joined forces in developing and implementing the student goals, objectives, methods, outcomes, and faculty development in meeting the specified IPE activity course. Moreover, it was decided that the first phase of implementation would evolve over a semester by introducing basic massage labs to the Radiology students. Organizational support and commitment from facilitators and senior management is the key to ensure IPE programs become successful new ways in learning a health care profession (Reeves, Goldman, & Oandasan, 2007). The course goals, objectives, methods, outcomes, and faculty development functions are outlined in (Table 1).

Massage Therapy Instruction

<table>
<thead>
<tr>
<th>Component</th>
<th>Curricular Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Objectives</td>
<td>• Identify proper techniques of informing a patient on your intents</td>
</tr>
<tr>
<td></td>
<td>• Properly enter the patient’s “personal space.” (alert the patient of your needs in feel &amp; touch)</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Identify specific bony anatomy used as landmarks in basic positioning</td>
</tr>
<tr>
<td>- Learn proper technique in touching a patient</td>
</tr>
<tr>
<td>- Understand the feelings of the patient (feeling of vulnerability &amp; invasion of personal space)</td>
</tr>
<tr>
<td>- Demonstrate effective communication skills during the exam</td>
</tr>
<tr>
<td>- Demonstrate proper manipulation and positioning of the patient</td>
</tr>
<tr>
<td>- Demonstrate confidence and a sense of ease to the patient when positioning</td>
</tr>
<tr>
<td>- Improve team working skills between both professions</td>
</tr>
<tr>
<td>- Establish and maintain lab-focused learning</td>
</tr>
<tr>
<td>- One-on-one learning (one radiology student to one massage student)</td>
</tr>
<tr>
<td>- Enhancement of radiology students touching and manipulation techniques</td>
</tr>
<tr>
<td>- Improving massage therapy students’ anatomy knowledge</td>
</tr>
<tr>
<td>- Increasing teamwork learning by being dependent upon each other’s knowledge of their own profession</td>
</tr>
<tr>
<td>- Increasing collaboration and communication between the students</td>
</tr>
<tr>
<td>- Understanding of proper patient care, and ease of movement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>- One-on-one learning with instructors</td>
</tr>
<tr>
<td>- Individual areas for comfortable and close learning between students, and between students and instructor (separate massage tables within individual draped spaces)</td>
</tr>
<tr>
<td>- Labs will be conducted with small sections of the classes for optimal learning and individual attention</td>
</tr>
<tr>
<td>- Students will be instructed to wear comfortable clothing (e.g. sweat pants, t-shirts, sweat shirts) to allow for easy identification of bony landmarks and ease of movement for the students on the table</td>
</tr>
<tr>
<td>- Students will acquire information from instructors and apply information learned to each other under observation</td>
</tr>
</tbody>
</table>
| Learner Evaluation/Assessment | • Evaluation of student’s performance will be completed by instructors  
• Evaluations will be conducted on a Likert scale grading system  
• Assessment of student confidence and use of effective communications are measured.  
• Areas of effective manipulation, positioning, and anatomy recognition will be graded on lab competency forms and also during practical exams (scenario based learning)  
• Comparison of students grades when measuring these specific areas will be compared to previous classes before the IPE was commenced  
• Effectiveness will be measured by RAD 130 practical exam grades |
|---|---|
| Faculty Development | • Understanding of specific roles for each facilitator representing each discipline  
• Set predetermined guidelines for each profession and facilitator  
• Make a proposal to satisfy the need of each facilitator involved  
• Design the IPE program implementation together promoting teamwork  
• Follow-through with any discrepancies or concerns  
• Stay in constant contact with facilitators to see the vision through  
• Never assume your profession to be superior over another, for IPE to work, every professional is equal in seeking improved patient care |

*Table 1: Inclusion of Massage Therapy Techniques in Radiology Student Curriculum*
These established goals, outcomes, and methods will strengthen the IPE concept of anticipating the needs of others, adjusting to each other’s actions within the changing environment of healthcare, and to support a shared understanding of how a procedure should transpire in order to identify any inaccuracies that may occur, and how to address those inaccuracies if needed.

Results of IPE Implementation Phase One (Massage Therapy)

The following chart demonstrates the IPE activity (massage therapy techniques) that were introduced to the RAD 130, Radiographic Procedures course, which is a first-year program course incorporating basic positioning and techniques required for a foundation to build upon in order to progress within the program (see Chart 1). The chart displays the cohort average for five practical/scenario exams. Each cohort consisted of fifteen to sixteen students consecutively. All cohorts involved in the case study were first year, first semester students in the Radiologic Sciences program. The chart also displays the four-year cohort average pre-IPE activity implementation (2008-2011), and the four-year cohort average post-IPE activity implementation (2012-2015).
Chart 1: IPE implementation improves practical/scenario exam scores for Radiologic Sciences Program students

(Chart 1) shows a distinct percent variance between the pre-IPE activity implementation cohorts, and the post-IPE activity implementation cohorts. This shows an average (mean) increase of 9.2% from the lowest pre-IPE cohort of 2008 @ (85.4%), to the highest post-IPE cohort of 2015 @ (94.6%). Furthermore, the chart shows a positive average (mean) increase of 2.4% from the highest pre-IPE cohort of 2011 @ (90.0%), to the lowest post-IPE cohort of 2012 @ (92.4%). This represents an overall increased average (mean) of 5.8% on the practical/scenario exams after the introduction of the IPE activity to these cohorts in RAD 130.
Implementation of Phase Two (PTA & Nursing)

The second phase of the implementation of IPE into the Radiologic Sciences program took place one calendar year after the first phase was initiated. Again, all the cohorts for the second phase consisted of fifteen to sixteen students. Therefore, after the initialize introduction of IPE into the Radiologic Sciences curriculum, the cohorts were being introduced to IPE in two separate Radiology courses. For this succeeding phase of implementation, it was decided that Physical Therapy Assistant (PTA), faculty and Nursing faculty would introduce their discipline into the profession of Radiology. Both disciplines instructed basic labs familiarizing the Radiology students to proper techniques in patient transfer from PTA instructors, and patient vital signs and oxygen care from Nursing instructors. Again, course goals, objectives, methods, outcomes, and faculty development functions were implemented as outlined in (Table 2 & 3).

Physical Therapy Assistant Instruction

<table>
<thead>
<tr>
<th>Component</th>
<th>Curricular Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Objectives</td>
<td>• Identify proper transfer techniques</td>
</tr>
<tr>
<td></td>
<td>• Define the terms associated with body mechanics</td>
</tr>
<tr>
<td></td>
<td>• Describe the basic principles of proper lifting and transfer techniques</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate effective communication skills during the transfer</td>
</tr>
<tr>
<td></td>
<td>• Identify five standard patient positions in proper transfers</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate confidence and a sense of ease to the patient when transferring</td>
</tr>
<tr>
<td></td>
<td>• Improve team working skills</td>
</tr>
<tr>
<td>Content</td>
<td>• Establish and maintain lab-focused learning</td>
</tr>
<tr>
<td></td>
<td>• Body mechanics</td>
</tr>
<tr>
<td></td>
<td>• Understanding base of support</td>
</tr>
</tbody>
</table>
### Methods
- One-on-one learning with instructors
- Individual areas for comfortable and close learning between students, and between students and instructor
- Labs will be conducted with small sections of the classes for optimal learning and individual attention
- Students will acquire information from instructors and apply information learned to each other under observation

### Learner Evaluation/Assessment
- Evaluation of student’s performance will be completed by instructors
- Evaluations will be conducted on a Likert scale grading system
- Assessment of student confidence and use of effective communications are measured
- Comparison of students grades when measuring these specific areas will be compared to previous classes before the IPE was commenced
- Effectiveness will be measured by exam grades specific to content covered (Exam 3)

### Faculty Development
- Understanding of specific roles for each facilitator representing each discipline
- Set predetermined guidelines for each profession and facilitator
- Make a proposal to satisfy the need of each facilitator involved
- Design the IPE program implementation together promoting teamwork
- Follow-through with any discrepancies or concerns
- Stay in constant contact with facilitators to see the vision through
- Never assume your profession to be superior over another, for IPE to work, every professional is equal in seeking improved patient care

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**Table 2: Inclusion of PTA Techniques in Radiology Student Curriculum**
### Nursing Instruction

<table>
<thead>
<tr>
<th>Component</th>
<th>Curricular Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning Objectives</strong></td>
<td>- Discuss the significance of each of the four vital signs: temperature, respiration, pulse, and blood pressure</td>
</tr>
<tr>
<td></td>
<td>- Identify the normal range for each of the four vital signs</td>
</tr>
<tr>
<td></td>
<td>- Explain the implication of abnormal vital signs</td>
</tr>
<tr>
<td></td>
<td>- Explain the indications for administering oxygen therapy</td>
</tr>
<tr>
<td></td>
<td>- Differentiate high-flow and low-flow oxygen delivery devices</td>
</tr>
<tr>
<td></td>
<td>- Discuss the significance of homeostasis</td>
</tr>
<tr>
<td></td>
<td>- Explain the mechanisms that adapt and maintain homeostasis</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>- Patient homeostasis</td>
</tr>
<tr>
<td></td>
<td>- Mechanisms for homeostasis</td>
</tr>
<tr>
<td></td>
<td>- Vital signs</td>
</tr>
<tr>
<td></td>
<td>- Increasing teamwork learning by being dependent upon each other’s knowledge of their own profession</td>
</tr>
<tr>
<td></td>
<td>- Normal vital signs and body temperatures (routes of measurement)</td>
</tr>
<tr>
<td></td>
<td>- Physiology of pulse (rate, measurement, and pulse oximeter)</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td>- One-on-one learning with instructors</td>
</tr>
<tr>
<td></td>
<td>- Individual areas for comfortable and close learning between students, and between students and instructor</td>
</tr>
<tr>
<td></td>
<td>- Labs will be conducted with small sections of the classes for optimal learning and individual attention</td>
</tr>
<tr>
<td></td>
<td>- Students will acquire information from instructors and apply information learned to each other under observation</td>
</tr>
<tr>
<td><strong>Learner Evaluation/Assessment</strong></td>
<td>- Evaluation of student’s performance will be completed by instructors</td>
</tr>
<tr>
<td></td>
<td>- Evaluations will be conducted on a Likert scale grading system</td>
</tr>
<tr>
<td></td>
<td>- Assessment of student confidence and use of effective communications are measured</td>
</tr>
<tr>
<td></td>
<td>- Comparison of students grades when measuring these specific areas will be compared to previous classes before the IPE was commenced</td>
</tr>
<tr>
<td></td>
<td>- Effectiveness will be measured by exam grades specific to content covered (Exam 4)</td>
</tr>
</tbody>
</table>
Faculty Development

- Understanding of specific roles for each facilitator representing each discipline
- Set predetermined guidelines for each profession and facilitator
- Make a proposal to satisfy the need of each facilitator involved
- Design the IPE program implementation together promoting teamwork
- Follow-through with any discrepancies or concerns
- Stay in constant contact with facilitators to see the vision through
- Never assume your profession to be superior over another, for IPE to work, every professional is equal in seeking improved patient care

Table 3: Inclusion of Nursing Techniques in Radiology Student Curriculum

Results of IPE Implementation Phase Two (PTA & Nursing)

(Chart 2) represents the subsequent phase of implantation of an IPE activity into an existing Radiologic Sciences program, which was the RAD 101 course, Introduction to Radiography. This second implementation took place in 2009, one calendar year after the first cohort of IPE implementation (massage therapy), which began in 2008. This chart exemplifies the addition of Physical Therapy Assistant PTA faculty instructing a series of basic labs consisting of patient transfer techniques which is represented by Exam 3 (orange bar), and Nursing faculty also instructing a series of labs consisting of vital signs and oxygen, represented by Exam 4 (blue bar). The chart signifies seven years total for this second phase of IPE implementation: three years pre-IPE activity (2009-2011), and four years post-IPE activity (2012-2015).
Chart 2: IPE implementation of PTA improves results on Exam 3

(Chart 2) shows a distinct percent difference between the pre-IPE activity implementation study cohorts, and the post-IPE activity implementation study cohorts. Looking at Exam 3 (orange bar), the chart shows an average (mean) increase of 18.1% from the lowest pre-IPE Exam 3 of 2010 @ (76.4%), to the highest post-IPE Exam 3 of 2012 @ (94.5%). Although, the chart represents a negative average (mean) decrease of -0.1% from the highest pre-IPE Exam 3 of 2011 @ (87.8%), to the lowest post-IPE Exam 3 of 2015 @ (87.7%). Therefore, this signifies an overall increased average (mean) for all Exam 3’s from 2009-2015 of 9% after the introduction of the IPE implementation of PTA patient transfer techniques to RAD 101.
Chart 3: IPE implementation of Nursing improves results on Exam 4

(Chart 3) indicates that there is also a distinct percent difference between the pre-IPE activity implementation study cohorts, and the post-IPE activity implementation study cohorts. Looking at Exam 4 (blue bar), the chart shows an average (mean) increase of 10.5% from the lowest pre-IPE Exam 4 of 2009 @ (83.2%), to the highest post-IPE Exam 4 of 2013 @ (93.7%). Although, the chart represents a negative average (mean) decrease of -1.3% from the highest pre-IPE Exam 4 of 2010 @ (89.2%), to the lowest post-IPE Exam 4 of 2012 @ (87.9%). Therefore, this signifies an overall increased
average (mean) for all Exam 4’s from 2009-2015 of 4.6% after the introduction of the
IPE implementation of Nursing vital signs and oxygen care to RAD 101.

Cohort Demographics

As stated earlier, each cohort consisted of fifteen to sixteen students
consecutively. All cohorts involved in the case study were first year, first semester
students in the Radiologic Sciences program. (Table 4) below illustrates the
demographics of each cohort by year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number of Students</th>
<th>Male</th>
<th>Female</th>
<th>White</th>
<th>African American</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>15</td>
<td>4</td>
<td>11</td>
<td>14</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2009</td>
<td>15</td>
<td>1</td>
<td>14</td>
<td>14</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>15</td>
<td>5</td>
<td>10</td>
<td>12</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>15</td>
<td>4</td>
<td>11</td>
<td>13</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2012</td>
<td>15</td>
<td>4</td>
<td>11</td>
<td>11</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2013</td>
<td>16</td>
<td>2</td>
<td>14</td>
<td>15</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>15</td>
<td>2</td>
<td>13</td>
<td>13</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2015</td>
<td>15</td>
<td>3</td>
<td>12</td>
<td>11</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4: Cohort Demographics for the entire case study by year

Conclusion

Results indicated that IPE is a new concept useful for improving patient
outcomes, increased delivery of quality services, reduced medical errors, improved
problem solving and communication skills, and teamwork among healthcare
professionals. The study provides support for the implementation of IPE in community
colleges teaching health sciences. Our results are best illustrated by Figure 2 below. The
essential issue is to find and implement shared learning opportunities that are supremely
relevant to students in each professional area. Time is of the essence for both faculty and
students. We found the following essential: 1) Programs should not be enlarged; 2) the shared learning must have central relevance to each program; 3) Students appreciate sharing learning when each professional group can contribute essential deep expertise to the task (especially important in the anatomy and respectful touch module); 4) It is essential that faculty collaborate on the design of the learning objectives and measurement; and 5) Implementing a successful IPE program takes time and a culture of collaboration from faculty.

Figure 2: Sample program’s relevance before and after IPE implementation

Presently, there is shortage of healthcare personnel in the world. As such, many of the policy makers are in quest of new inventive methods that will help in boosting health workforce around the globe. Interprofessional education is one of the innovative
traditions to augment teamwork in healthcare systems. The alliance between other health science programs within a division is important in the current career system. Each profession has essential roles within healthcare as IPE is introduced to establish a strong underpinning in achieving the most innovative way of teaching. The collaborative determination has a great bearing on influencing student custody of their profession.

At a deeper level this study sought to determine and update current research data assets, which not only seeks to provide rationale and justification to the ever widening scope of interprofessional education, its positive and well-meaning impacts, but also to delve deeper into its implications and outcomes entailing development, propagation, proliferation and dispersion of interprofessional curriculum. Therefore, stressing the interactive collaboration and harmonious interactions between a healthcare course and its implicative outcomes.

Organizational support, dedicated commitment, and buy-in from the facilitators who are passionate about their profession are key to ensure that IPE curriculums become a successful new way in learning a healthcare profession. Collaboration among each discipline without the sense of superiority is a must to build a successful IPE team in changing the way we expect our students to excel in their prospective professions. There is still a circumscribed perception on the effects and outcomes of interprofessional learning, but those findings are slowly coming to light with encouraging results. This case study was fortunate to have been held within a small technical college where teamwork, and communication among disciplines are much more encouraged and applied.
Since the onset of this case study with IPE implementation phases one and two successfully established and underway, there has been a continuous collaboration among division faculty members with the addition of new IPE activities developed and implemented within other health sciences programs. There has not been adequate time elapsed since their conception into the curriculum, but all indications appear to be consistent with the favorable results of phases one and two. These are a few examples of new division IPE implementations:

- Nursing faculty instruct vital signs and oxygen care to the PTA and Surgical Technology programs
- Surgical Technology faculty instruct sterile techniques to the Radiology and Nursing programs
- Radiology faculty instruct Surgical Technology students in radiation protection, since they are exposed to radiation exams during operating-room procedures
- Spanish language instructors have implemented labs of basic commands in Spanish which the Radiology and PTA programs utilize on a daily basis when speaking with specific patients.

As mentioned earlier, the resources you already possess must be utilized to their fullest extent to make IPE implementation successful. As a small technical college, we are always dealing with budgetary constraints, so IPE was the perfect solution to producing optimal healthcare workers who have the extra advantage in meeting today’s needs in patient care.
References


http://www.who.int/hrh/resources/framework_action/en/