ISSN 2475-529X

Research Article

Journal of Nursing & Healthcare

# Outcomes from Classroom, Simulation, and Clinical Experiences in an Interprofessional Education Setting

**Sherleena Buchman[1]* and Jeffrey J. DiGiovanni[2]**

[1]*Assistant Professor, School of Nursing, College of Health Sciences and Professions, Ohio University USA.*

[2]*Department of Communication Sciences and Disorders, University of Cincinnati,*

***Corresponding author**
Sherleena Buchman, Assistant Professor, School of Nursing, College of Health Sciences and Professions, Ohio University USA, E-mail:buchmans@ohio.edu

**Submitted**: 24 Oct 2018; **Accepted**: 01 Nov 2018; **Published**: 06 Nov 2018

## Abstract

*Upon entering the workforce, many healthcare professionals are expected to work as members of an interprofessional team. This contrasts with the current educational model at many universities where students are taught in silos about their own professions. This article describes a 15-week interprofessional course experience and outcomes related to didactic, simulation, and clinical experience over three semesters representing eight different professions in one University. This course allowed students to learn not only about each other's professions through classroom, presentations, but also to learn from and with each other through a series of high-fidelity simulation and clinical experiences. Three different measurements were used including a readiness to learn survey, introduction survey and a pre/post-interprofessional competencies survey. Quantitative analysis was completed on the pre-and post-surveys. Surveys were analyzed and students' self-efficacy ratings showed significant improvements in the areas of Teamwork, Roles/Responsibilities, and Communication as well as an increase in knowledge of areas of patient centered care and interdisciplinary teamwork. Areas that involved Teamwork and Roles/Responsibilities regarding other professions were the largest improvements over the course of the semester. This indicates that the interprofessional course emphasized learning in these domains as it would be the most beneficial to learn.*

## Keywords:

Interprofessional education
Interprofessional simulation
Interprofessional collaboration
Interprofessional learning
Interprofessional research

## Introduction

Interprofessional collaboration has been reinvigorated and within the last decade has been effectively implemented in many countries [1-4]. A universal, nationwide health goal is to provide patients with optimal patient care leading professionals to work closely together to perform assessments and evaluations and to relay the overlapping information. The critical elements of defining interprofessional education involve placing students in collaborative environments where they can learn "about, from and with each other" (WHO, 2015, p. 10). Collaborative care helps improve patient outcomes and reduces the risks of harming patients from avoidable mistakes [1, 5]. Students engaged in interprofessional education are more likely to recognize their role in a team while valuing the opinions and what other disciplines have to offer. Students in these interprofessional teams will discover how closely their ethics and practice guidelines overlap with their team members, making the discovery of how closely related their professions can be [6].

Several factors have led to the increased interest in interprofessional education. With the implementation of the Affordable Care Act in 2010, interprofessional collaboration was highlighted to mitigate preventable medical errors and optimize patients' healthcare [5, 7]. Lack of training could inhibit the effectiveness of collaborative care, causing confusion among roles and expectations of individuals in a work environment. While in their individual professional programs, an entirely new set of competencies, aimed toward building their skillset in team-based, patient-centered care, can be integrated [6].

## Background

The resurgence of interprofessional education is a relatively recent one; 71.1% out of 83 courses were less than five years old as of 2012 [8]. The authors further revealed the range of what is deemed an interprofessional course appears to vary considerably. In some cases, classes may be offered as a one-day training session whereas in other situations, they are semester-long. Previous research shows the effects on student's attitudes and self-efficacy towards interprofessional education improve significantly when enrolled in a course for a longer period of time [8-13]. However, research is still needed in order to show benefits and shortcomings of programs in order to better understand how students are affected.

The Department of Defense and the Agency for Healthcare Research and Quality developed a set of collaborative tools, called Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), to provide working health professionals training to improve their communication and teamwork skills while working collaboratively among others [14]. The TeamSTEPPS curriculum has

been adapted across the United States in many settings of health care and modified to be used in educational settings [14-17]. Individuals involved have shown improvement in the area of interprofessional collaboration [16, 18]. However, despite the importance of utilizing interprofessional collaboration in the workforce, interprofessional education remains a nascent component of health profession students' curriculum.

Theoretical approaches guiding interprofessional education have been articulated. Unfortunately, variation in methods across studies render direct comparisons difficult. Blakeney and colleagues (2012) reviewed faculty development in interprofessional education using the adult learning theory inclusive of the educational process from peer learning to reflective learning for the development of interprofessional educational models [8]. Thistlethwaite and colleagues (2014) stressed that while there continues to be a need for an agreed upon established theory, the use of an interprofessional framework can be successful in guiding interprofessional education [19]. By applying these principles, core competencies can be used to help evaluate the effectiveness of interprofessional education by targeting specific content areas. Core competency frameworks of interprofessional education are believed to help target specific areas to help make health professionals successful in collaboration among professionals [20]. The Interprofessional Education Collaborative (IPEC) framework is made up of 42 interprofessional competencies, each placed into one of four categories, which include: Value/Ethics for Interprofessional Practice, Roles/Responsibilities, Interprofessional Communication, and Teams and Teamwork [21]. These competencies can shape how curricula are formed for interprofessional learning. Mastery of these domains ensures that students gain an introspective professional identity as well as a mutual understanding and respect among other students [22].

There are still many limitations to providing post-graduate health professionals exposure to collaborative practice in real world clinical settings including the rural setting. The number of physicians per 100,000 citizens has increased from ~150 to ~275 since 1940 in large metropolitan areas whereas the number has remained a rather stagnant ~60 in rural areas [23]. Despite these professions' potential to work together, in future jobs, courses are rarely taught together thus limiting student interaction minimal [14, 16]. One strategy to mitigate lack of interprofessional training is to introduce interprofessional education into a health professional student's curriculum.

Survey instruments persist as the preferred method of competency assessment. Existing instruments can be used to evaluate interprofessional curricula, however, there is no evidence on what instrument is best practice [24]. In light of this, a pre-only survey, the Readiness for Interprofessional Learning Scale (RIPLS), was employed in the current study to establish the students' readiness for IPE [25]. Additionally, the authors developed a three-question introductory survey that focused on aspects of interprofessional education. Finally, the IPEC survey, a 42-question survey was used as a pre/post measure to assess students' progress in their competency development in each of the four domains: values/ethics, roles/responsibilities, interprofessional communication, and teams and teamwork [21].

TeamStepps concepts married with the IPEC framework were used to guide the development of interprofessional simulation experiences. The focus of these simulations was not on the individual professional skill sets rather were on the interprofessional competencies outlined through the IPEC domains. The course under study embraced experiential learning in a team-based environment through direct-patient experiences as well as high-fidelity simulation experiences. As such, the nature of the course curriculum emphasized team-based skills such as communication, roles and responsibilities, and teams and teamwork.

With the development and availability of these tools, an interprofessional education course was designed with a combination of classroom experiences, simulations, and clinical-field experiences. To support this endeavor, the authors were awarded a grant under the Medicaid Technical Assistance and Policy Program (MEDTAPP) Health Care Access (HCA) mechanism. These funds were provided by the Ohio Department of Medicaid which were intended to support and promote projects designed to recruit, train, and retain healthcare professionals to better serve the Medicaid populations. The purpose of this interprofessional course was to engage students from multiple professions and for the students to gain knowledge on how to communicate respectfully and work together in a team to achieve collective goals in order to optimize patient-centered care. Also, it has been shown that benefit of interprofessional education is only realized when the students are exposed in a variety of situations thus growing their ability to work together successfully with a team [26]. Following approval from IRB, data were collected to measure how well these skills learned through interprofessional education resonate with students as they prepare to enter the work force in their future professions. Unlike previous interprofessional opportunities, this course was created to include a variety of health professions (e.g., up to eight different professions) with students from various class ranks; this created interprofessional interaction of graduate and undergraduate students in varying health professions (audiology, nursing, physical therapy, music therapy, nutrition, speech language pathology, social work, and medical students) to simulate the expectations for teamwork in the workplace.

Given the course's emphases on three of IPEC's core competencies, it was hypothesized that students' self-ratings would improve in the introduction survey questions as well as the following three core competencies would significantly improve in more than half of the sub-competencies after the course: roles/responsibilities, interprofessional communication, and teams and teamwork. Since the curriculum did not explicitly include interprofessional ethics content, it was further hypothesized that fewer than half of the sub-competencies of the Values/Ethics IPEC core competency would improve. In addition, given the relative lack of exposure students had in interprofessional-care concepts prior to this experience, it was hypothesized that students would improve in their perceptions of patient-centered care, interdisciplinary teamwork, and preference for team-based work at the conclusion of the course. To address these hypotheses, self-reported student data from three identical, consecutive course offerings from the same calendar year were collapsed and analyzed.

## Method

The goal of this research study was to determine how a 15-week interprofessional education curriculum comprising of three components of classroom, simulation, and real-world experience affects students' attitudes toward interprofessional education, their self-efficacy in collaborating, and overall understanding

of interprofessional collaboration. In review of the curricular programming, major emphases were placed on inter-team dynamics, including communication across disciplines, conflict resolution, role negotiation, and collaboratively reaching team goals, through direct-patient interaction and high-fidelity simulation experiences. As such, while interprofessional ethics were addressed implicitly, it was not explicitly covered.

Data were aggregated from three course offerings, once for each of spring, summer, and fall semesters in the calendar year 2016. One survey was disseminated at the beginning of each course and two other survey instruments were distributed pre- and post- course experience to understand the change in attitudes and interprofessional competencies. The pre-only survey was the Readiness for Interprofessional Learning Scale (RIPLS; 19-scaled questions related to attitudes towards interprofessional learning) whereas the pre- and post-surveys were The Introduction Survey (3-scaled questions regarding perceptions) and the IPEC Competency Survey (42-scaled questions regarding IPEC domains).

### Introduction Survey

The Introduction Survey was developed by the authors to ascertain a broad sense of students' perceptions of their knowledge of patient-centered care, interdisciplinary teamwork as well as their preference for working alone or in groups. Each question allowed for a seven-point response. For the knowledge questions, a "1" referred to "no knowledge" and a "7" to "expert" whereas a "1" referred to "prefer to work alone" and "7" indicated "prefer to work in groups" for the question assessing preference of working alone or in groups.

### IPEC Competency Survey

The IPEC Competency Survey reflects the four IPEC domains, values/ethics, roles/responsibilities, interprofessional communication, and teams and teamwork [21]. The IPEC survey was used to measure overall competency in interprofessional collaboration. This survey tool was based on measuring the effectiveness of an interprofessional education program derived from the IPEC core competencies. This survey presented questions from the four IPEC domains; each question began with the phrase "I am able to…" and students rated themselves based on their self-perceived ability using a 5-point Likert scale with 1 ranking as "strongly agree" to 5 ranking as "strongly disagree" [24, 27].

### RIPLS

The RIPLS survey was used to assess attitudes thought to be associated with strong proclivity towards interprofessional learning [25]. This survey includes 19 questions designed for students in health and social care fields. Each question provides a five-point Likert scale ranging from "strongly disagree" to "agree". McFadyen and colleagues (2005) demonstrated construct validity for the questions when categorized into four subscales, "teamwork and collaboration", "negative professional identity", "positive professional identity", and "roles and responsibilities" [28]. Developed for in-training students, the RIPLS has also been validated for post-graduates from a variety of health professions [29-32].

These two surveys were used to determine the success of the curriculum designed at this university by measuring students' self-rating perceptions before and after their exposure to a newly developed interprofessional education.

The instructors of the course explained and clarified any questions before the surveys were distributed. Surveys were deployed via an online survey tool, Qualtrics, which facilitated data collection, storage, and aggregation. The surveys were completed during the first and/or last class session for the pre- and post-surveys, respectively, as appropriate. The students used their own laptops to follow a link which took them to each survey, although portable devices were available to the students in the rare case they did not have their own device with them. Also, Responding to these surveys in class ensured near-100% participation.

### Procedure

This study assessed how a 15-week interprofessional education curriculum comprising of three components of classroom, simulation, and real-world experience affects students' attitudes toward interprofessional education, their self-efficacy in collaborating, and overall understanding of interprofessional collaboration. Students enrolled in Spring 2016, Summer 2016, and Fall 2016 completed surveys prior to the beginning of the course and at the end of the semester. These surveys were used to assess students' self-ratings from the beginning to the end of the course, allowing students to rate themselves on how much they gained throughout the duration of the course.

In the beginning of the semester, students were grouped into interprofessional student teams (IPE student teams) representative of the course enrollment from each profession, with the intention of having a group combined of at least one person from each profession. Students remain in the IPE student teams throughout the entire course. These IPE student teams provide a more diverse experience for the students involved since the students were given the opportunity to contribute to a team of multiple professions that worked closely together towards a common goal in patient-centered care. Students learned how to acknowledge the importance of their own profession when contributing to the plan of care for a patient.

Students enrolled in this innovative course were responsible for completing three components that included classroom, simulation and clinical during the semester. Students learned from, about and with each other in the classroom portion of the course through participating on the IPE team they were assigned to. Additionally, they interacted in a real "patient" scenario at a local facility, while writing, assessing, and completing simulations in the Ohio University Heritage College of Medicine simulation lab. Each component of this course required the IPE student teams to work collaboratively together and debrief on the session. Debriefing provided the students the time to reflect on what went well, or what didn't go well, and to self-identify the things they could do differently next time.

The didactic portion of class had students learning about the roles and responsibilities of each profession represented in the course. For example, the nursing students created a presentation explaining the Scope of Practice for a nurse and shared with the other members of the team. Upon completion of all represented professions introducing the other healthcare professions to their Scope of Practice, the students worked within their assigned interprofessional team to compare the commonalities and to contrast and identify the uniqueness of each represented healthcare profession.

The IPE teams actively participated in five simulations experiences throughout the semester that allowed the team to work together to

assess a patient as a team. The nursing students in the course were the only group of students to have previous exposure to simulations in their professions curriculum. The first simulation was a classroom based low-fidelity simulation where the IPE student teams learned the difference between low-fidelity, mid-fidelity and high-fidelity simulations. One TeamStepps concept, the Situation, Background, Assessment and Recommendation (SBAR) process, was integrated of each interprofessional simulation experience. A video depicting a simulation experience was provided.

Throughout the semester, three simulation experiences were created and provided by the faculty to the IPE student teams. The IPE Student teams were briefed with a scenario that outlined the patient case, they were given about fifteen minutes to review background on the patient and discuss their plan of meeting and assessing the patient. The IPE student teams were then led into the room to meet their patient. After the introduction occurred between the patient and the IPE team members, the scenario began. Each team was supplied with an SBAR communication tool to facilitate their interprofessional simulation such as the tool used by Kirwin and team in 2017 [33]. The IPE team interacted with the patient, which was played by either a standardized actor or a mannequin. The cases varied in duration from 10 to 15 minutes of active simulation time based on the scenario. Following each simulated experience, a debriefing process was facilitated by the faculty that promoted students learning about, from and with each other. The fifth IPE simulation experience was performed as the course final project. The IPE student teams developed their own IPE simulations that were approved by the faculty and then delivered to the other IPE student teams within the course utilizing the same pre-brief, experience, debrief method.

The clinical portion sent the IPE student teams to local facilities, either the Beacon School for children with developmental disabilities, or The Laurels skilled living facility with a geriatric patient population. At these facilities, the IPE student teams were assigned one resident/student and had three visit days spread over a few weeks to interview, assess, and develop a treatment plan. The first visit day was the interview day. The team reviewed the patient/student charts or IEP documents related to their assigned patient/student. The IPE student team gathered relevant information and formulates questions they feel are pertinent to ask regarding the health/care of who they are working with. The team then met the patient/student and had an informal interview getting to know and understand the patients'/students' needs better.

The second visit day was the assessment of the patient/student. The IPE student team members had to develop a plan to assess the patient as an IPE student team while obtaining information that each individual student within the IPE team would need to obtain in order to complete the assessment.

The third and final day was the "treatment" day. This is where the IPE student teams had to collaboratively work together to help the patient better understand their treatment plan that has already been established by their primary care physicians. After each of these visit days, the students met with an instructor to debrief on the visit day session.

Following each simulation experience and visit day, the students met in the didactic classroom to give a report back on what the group did the previous week. The report backs helped the students in the other IPE student teams understand how the reporting group completed their simulation or visit and the positive and negative experiences associated with the experience. This interactive portion of the class allowed students to ask questions, offer feedback, and/or give suggestions on a given patient interaction.

## Results

The RIPLS survey was chosen as a pre-test to ensure students had a strong aptitude for interprofessional learning. Each of the 19 questions were placed into one of four subscales as described by McFadyen and team, (2005) [28]. The group-mean averages for questions within each subscale are shown in Table 1. The fourth subscale was impacted by question 19: "I have to acquire much more knowledge and skill than other students/professionals in my own faculty/organisation". The mean for this question was 3.49 (standard deviation, 0.87) whereas the means for questions 17 and 18 were 4.79 (0.46) and 4.17 (0.73), respectively.

**Table 1: RIPLS data displayed by subscale**

| Subscale with included question numbers | Mean | Standard Deviation |
|---|---|---|
| Teamwork & Collaboration (1-9) | 4.78 | 0.095 |
| Negative Professional Identity (10-12) | 4.69 | 0.17 |
| Positive Professional Identity (14-16) | 4.63 | 0.039 |
| Roles & Responsibility (17-19) | 4.15 | 0.65 |

Responses from the Introduction and IPEC questionnaires were analyzed and separated into pre and post data. For the Introduction Surveys, pre-and post-survey data could not be matched due to a lack of identifying information on the surveys. A Mann-Whitney U test was performed to analyze the Introduction survey pre-and post-survey scores. Results showed that median scores for 2 questions in the Introduction survey were significantly different between pre and post surveys; the pre-survey means (Q1 = 4.81, Q2 = 3.90) were all significantly lower than post survey means (Q1 = 5.63, Q2 = 5.47), all $p < .01$.

For the IPEC survey, pre-and post-survey data were matched using identifying information; only data from students that completed both pre-and post-surveys were used in the analysis. The IPEC instrument was broken down into the four domains and analyzed using the Wilcoxon signed ranks analysis on matched data. Mean pre- and post-IPEC survey scores were analyzed to assess any differences in scores within each domain. The Benjamini-Hochberg correction for multiple comparisons was used. Unlike the Bonferroni that controls for the Familywise error rate, the Benjamini Hochberg correction factor controls a False Discovery Rate. A false discovery rate of 5% was chosen for this study.

For two of the IPEC domains, Roles/Responsibilities and Teams & Teamwork, seven of the nine sub-competencies showed significant improvement. Our hypothesis proved true that greater than 50% of the sub-competencies within the Roles/Responsibilities and Teams & Teamwork domain improved. The other two domains, Interprofessional Communication and Values/Ethics, only two of the nine sub-competencies showed improvement. While our hypotheses regarding Values/Ethics proved true with less than 50% of the sub-competencies showing significant improvement, our hypotheses failed in the final domain, Interprofessional Communication, with only two of the 11 sub-competencies showing improvement. Tables 2-5 show each sub-competency for every IPEC domain with pre- and post-mean, standard deviation, and significance value. Sub-competencies that remained significant after the correction are denoted with an asterisk.

**Table 2: Roles/Responsibilities**

| Roles/Responsibilities Domain | Pre Score M, SD | Post Score M, SD | P-value |
|---|---|---|---|
| Q1. Communicate my roles and responsibilities clearly to patients, families, and other professionals | 4.07, 1.0 | 4.41, 0.50 | .058 |
| Q2. Recognize my limitations in skills, knowledge, and abilities | 4.44, 0.70 | 4.48, 0.51 | .796 |
| Q3. Engage diverse healthcare professionals with complementary professional expertise to develop strategies to meet specific patient care needs | 3.74, 1.35 | 4.56, 0.64 | .008* |
| Q4. Explain the roles and responsibilities of other care providers and how the team works together to provide care | 3.56, 1.34 | 4.41, 0.64 | .006* |
| Q5. Use the full scope of knowledge, skills, and abilities of available health professionals and healthcare workers to provide care that is safe, timely, efficient, effective, and equitable | 3.70, 1.54 | 4.44, 0.70 | .009* |
| Q6. Communicate with team members to clarify each member's responsibility in executing components of a treatment plan or public health intervention | 3.93, 1.21 | 0.23, 0.45 | .001* |
| Q7. Establish interprofessional relationships to improve care and advance learning | 4.33, 0.78 | 4.74,0.45 | .017* |
| Q8. Engage in continuous professional and interprofessional development to enhance team performance | 4.30, 0.95 | 4.74, 0.45 | .030* |
| Q9. Use unique and complementary abilities of all members of the team to optimize patient care | 4.07, 1.27 | 4.56, 0.64 | .035* |

**Table 3: Teams & Teamwork**

| Teams & Teamwork Domain | Pre Score M, SD | Post Score M, SD | P-value |
|---|---|---|---|
| Q1. Describe the process of team development | 3.81, 1.13 | 4.35, 0.67 | .017* |
| Q2. Describe the roles and practices of effective healthcare teams | 3.92, 1.09 | 4.38, 0.57 | .015* |
| Q3. Engage other health professionals in shared problem-solving appropriate to the specific care situation | 3.88, 1.14 | 4.69, 0.47 | .001* |
| Q4. Inform care decisions by integrating the knowledge and experience of other professions appropriate to clinical situation | 3.85, 1.90 | 4.58, 0.58 | .003* |
| Q5. Apply leadership practices that support collaborative practice and team effectiveness | 4.19, 0.85 | 4.50, 0.51 | .070 |
| Q6. Engage others to constructively manage disagreements that arise between healthcare professionals, patients, and families | 3.92, 1.09 | 4.42, 0.47 | .054 |
| Q7. Share accountability with other professions, patients, and communities for outcomes relevant to prevention and health care | 4.15,0.93 | 4.65, 0.58 | .011* |
| Q8. Reflect on my individual performance for my improvement | 4.62, 0.57 | 4.62, 0.51 | 1.0 |
| Q9. Reflect on my healthcare team's performance for my team's improvement | 4.38, 0.94 | 4.69, 0.70 | .106 |
| Q10. Use strategies that will improve the effectiveness of interprofessional teamwork and team-based care | 4.19, 0.98 | 4.62, 0.49 | .017* |

**Table 4: Interprofessional Communication**

| Interprofessional Communication Domain | Pre Score M, SD | Post Score M, SD | P-value |
|---|---|---|---|
| Q1. Choose effective communication tools and techniques to facilitate discussions and interactions that enhance team function | 4.19, 1.02 | 4.52, 0.50 | .101 |
| Q2. Communicate information with patients, families, and healthcare team members in a form that is understandable | 4.23, 0.80 | 4.44, 0.57 | .317 |
| Q3. Avoid discipline-specific terminology when possible | 3.74, 0.70 | 4.0, 0.73 | .111 |
| Q4. Express my knowledge and opinions to team members involved in patient care with clarity and respect | 4.04, 0.89 | 4.54, 0.56 | .008* |
| Q5. Listen actively, and encourage ideas and opinions of other team members | 4.48, 0.57 | 4.85, 0.36 | .002* |
| Q6. Give timely, sensitive feedback to others about their performance on the team | 4.12, 0.92 | 4.44, 0.79 | .041 |
| Q7. Respond respectfully to feedback from others about their performance on the team | 4.33, 0.82 | 4.59, 0.56 | .083 |
| Q8. Use appropriate, respectful language in a given difficult situation such as interprofessional conflict | 4.33, 0.86 | 4.70, 0.45 | .032 |
| Q9. Recognize how my experience and expertise contributes to communication, conflict resolution, and interprofessional working relationships | 4.26, 0.80 | 4.56, 0.57 | .070 |
| Q10. Recognize how my position in the hierarchy of the healthcare team, contributes to communication, conflict resolution, and interprofessional working relationships | 4.04, 1.0 | 4.44, 0.63 | .032 |
| Q11. Consistently communicate the importance of teamwork in patient-centered and community-focused care | 4.04, 1.17 | 4.48, 0.57 | 0.038 |

**Table 5: Values/Ethics**

| Values/Ethics Domain | Pre Score M, SD | Post Score M, SD | P-value |
|---|---|---|---|
| Q1. Place the interests of patients at the center of interprofessional health care delivery | 4.41, 0.64 | 4.81, 0.40 | .005* |
| Q2. Respect the privacy of patients while maintaining confidentiality in the delivery of team-based care | 4.56, 0.64 | 4.81, 0.40 | .094 |
| Q3. Embrace the diversity that characterizes patients and the health care team | 4.41, 0.64 | 4.70, 0.47 | .021 |
| Q4. Respect the unique cultures, values, roles/responsibilities, and expertise of other health professionals | 4.33, 0.83 | 4.74, 0.53 | .005* |
| Q5. Work in cooperation with those who receive care and those who provide support or care | 4.22, 0.89 | 4.56, 0.58 | .094 |
| Q6. Develop a trusting relationship with patients, families and other team members | 4.33, 0.88 | 4.59, 0.57 | .070 |
| Q7. Demonstrate high standards of ethical conduct and quality of care in my contributions to team-based care | 4.44, 0.85 | 4.74, 0.53 | .088 |
| Q8. Manage ethical dilemmas specific to interprofessional patient centered care situations | 4.04, 1.16 | 4.52, 0.51 | .021 |
| Q9. Act with honesty and integrity in relationships with patients, families, and other team members | 4.60, 0.75 | 4.89, 0.32 | .039 |
| Q10. Maintain competence in my own profession appropriate to my scope of practice or level of training | 4.52, 0.70 | 4.60, 0.57 | .617 |

## Discussion

It was expected that health science students would benefit from learning about interprofessional education by being enrolled in a course that's main focus is integrating multiple health professions together to learn from and with each other. Results showed areas of significance on each the survey used in the interprofessional course. The results are consistent with what the course objectives of focusing on collaborative care and understanding what each discipline has to offer when providing patient care.

When analyzing the IPEC Survey domains individually, the Roles/Responsibilities and Teams & Teamwork domains had the greatest number of significantly improved sub-competencies. In the Roles/Responsibilities domain results showed an increasing understanding of the roles and responsibilities of other professions, allowing students to see how their roles may overlap with others in the class. The two questions that were not significant focused on recognizing individual roles and responsibilities. Students enrolled in this course are far enough along in their program to be familiar with what they do individually in their profession so they are able to explain their own roles in patient care which could be why there was no significance in those questions from before and after the course. As such, this hypothesis was confirmed.

The Teams & Teamwork domain questions that were significant focused on how effective interactions between professions can optimize specific care related to the patient. The questions that were not significant in this domain focused on leadership qualities. Since these questions were not significant from pre-survey to post surveys, it suggests that this course strives to make students focus on the whole team performance as opposed to only individual performance. Thus, our second hypothesis was confirmed.

In the Interprofessional Communication domain, the two questions that improved significantly related to respectful and clear communication among team members as well as active listening. The questions that were not significant focused on topics that students cover in more core discipline specific classes, such as avoiding jargon, responding respectfully, or using appropriate language. While it is arguable that some of these should have existed prior to the course, others (e.g., avoiding jargon, choice of effective communication tools for team function) would be difficult to develop absent working on an interprofessional team. Therefore, it appears the third hypothesis predicting improvement in this domain was not confirmed.

The Values/Ethics domain also only had two sub-competencies that improved. While it is encouraging these were ones that included patient centeredness and respect for cultures and values roles and responsibilities of other professionals, the remaining eight questions did not show improvement. The course was largely designed around team dynamics and operations, and on that level, it is not surprising that those two sub-competencies improved. Overall, however, the hypothesis that this domain would not result in overall improvement was confirmed.

Two of the three questions from The Introduction Surveys revealed significantly higher scores on the post-survey scores than the pre-survey scores. These questions involved perceptions regarding, patient centered care and interdisciplinary teamwork. The improvement in scores tells the instructors that the students gained an increase in knowledge in both of these areas after the course was over.

## Concluding Comments

The data show a strong connection between the activities involved in the interprofessional course and the outcomes achieved. Namely, when involving students as interprofessional teams in a patient-centered context as well as high-fidelity simulations, improvements are likely to be measured in teamwork as well as roles/responsibilities. While some sub-competencies in communication and values/ethics showed improvement, there were far fewer than the other domains.


## Acknowledgements

The authors would like to acknowledge and thank graduate assistant Kathryn Kulasa for her dedication to interprofessional education.


## Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.


## Funding

The authors would like to acknowledge the Ohio Department of Medicaid, specifically the Medicaid Technical Assistance and Policy Program (MEDTAPP), Health Care Access (HCA) mechanism for the grant that supported this research.


## References


1. Burning S, Bhushan A, Broeseker A, Conway S, Duncan-Hewitt W, et al. (2009) Interprofessional education: Definitions, student competencies, and guidelines for implementation. American Journal of Pharmaceutical Education 73: 59. https://doi.org/10.5688/aj730459
2. Center for the Advancement of Interprofessional Education [CAIPE]. (2017) The Center for Advancement of Interprofessional Education. Retrieved 2/2/2018 from: https://www.caipe.org/about-us
3. Coster S, Norman I, Murrells T, Kitchen S, Meerabeau E, et al. (2008) Interprofessional attitudes amongst undergraduate students in health professions: A longitudinal questionnaire study. International Journal of Nursing 45: 1667-1681. https://doi.org/10.1016/j.ijnurstu.2008.02.008
4. Health Canada (2006) Interprofessional Education for Collaborative Patient-Centered Practice(IECPCP): Research Workshop Final Summary Notes. Retrieved from http://www.hc-sc.gc.ca/hcs-sss/pubs/hhrhs/2006-iecps-fipccp-workatel/index-eng.php
5. Nester J (2016) The importance of interprofessional practice and education in the era of accountable care. North Carolina Medical Journal 77(2). Retrieved from http://www.ncmedicaljournal.com/content/77/2/128.full.pdf+html
6. Bridges D, Davidson R, Soule Odegard P, Maki I, Tomkowiak J (2011) Interprofessional collaboration: Three best practice models of interprofessional education. Medical Education Online 16(1). https://doi.org/10.3402/meo.v16i0.6035
7. Chen C, Chen F, Mullan F (2012) Teaching health centers: A new paradigm in graduate medical education. Academic medicine: Journal of the Association of American Medical Colleges 87: 1752. doi:10.1097/ACM.0b013e3182720f4d
8. Blakeney E, Kim S, Choe L, Varpio, Malik E, et al. (2012) Current trends in interprofessional education of health sciences students: A literature review. Journal of Interprofessional Care

30: 83-89. http://dx.doi.org/10.3109/13561820.2015.1051615
9. Carpenter J (1995) Interprofessional education for medical and nursing students: Evaluation of a programme. Medical education 29: 265-272. doi: 10.1111/j.1365-2923.1995.tb02847.x
10. Curan VR, Sharpe D, Flynn K, Button P (2010) A longitudinal study on the effect of an interprofessional education curriculum on student satisfaction and attitudes towards interprofessional teamwork and education. Journal of Interprofessional Care 24: 41-52. https://doi.org/10.3109/13561820903011927
11. Williams B, Brown T, Boyle M (2012) Construct validation of the readiness for interprofessional learning scale: A Rasch and factor analysis. Journal of Interprofessional Care 26: 326-332. doi: 10.3109/13561820.2012.671384
12. Renschler L, Rhodes D, Cox C (2016) Effect of interprofessional clinical education programme length on students' attitudes towards teamwork. Journal of Interprofessional Care 3: 338-346. https://doi.org/10.3109/13561820.2016.1144582
13. Watters C, Reedy G, Ross A, Morgan NJ, Handslip R, et al. (2015) Does interprofessional simulation increase self-efficacy: A comparative study. BMJ open 5: e005472. http://dx.doi.org/10.1136/bmjopen-2014-005472
14. Henriksen K, Battles JB, Keyes MA, et al. (Eds.) (2008) Advances in patient safety: New directions and alternative approaches (Vol. 3: Performance and Tools). Rockville (MD): Agency for Healthcare Research and Quality (US). Prologue: The Shift toward Performance and Tools. Retrieved 12/7/2017 from https://www.ahrq.gov/downloads/pub/advances2/vol3/Advances-King_1.pdf
15. King HB, Battles J, Baker DP, Alonso A, Salas E, et al. (2008) TeamSTEPPS™: team strategies and tools to enhance performance and patient safety. Agency for Healthcare Research and Quality. Retrieved 2/1/2018 from: https://www.ncbi.nlm.nih.gov/books/NBK43686/?report=reader
16. Robertson B, Kaplan B, Atallah H, Higgins M, Lewitt MJ, et al. (2010) The use of simulation and a modified TeamSTEPPS curriculum for medical and nursing student team training. Simulation in Healthcare 5: 332-337. doi: 10.1097/SIH.0b013e3181f008ad
17. Agency for Healthcare Research and Quality. (2015, July). TeamSTEPPS®: Research/evidence base. Retrieved 1/7/2018 from: http://www.ahrq.gov/teamstepps/evidence-base/index.html
18. Reed T, Horsley TL, Muccino K, Quinones D, Siddall VJ, et al. (2017) Simulation using TeamSTEPPS to promote interprofessional education and collaborative practice. Nurse Educator 42: E1-E5. doi: 10.1097/NNE.0000000000000350
19. Thistlethwaite JE, Forman D, Matthews LR, Rogers GD, Steketee C,et al. (2014) Competencies and frameworks in interprofessional education: a comparative analysis. Academic Medicine 89: 869-875. doi: 10.1097/ACM.0000000000000249
20. Hepp S, Suter E, Jackson K, Deutschalnder S, Makwarimba E, et al. (2014) Using an interprofessional competency framework to examine collaborative practice. Journal of Interprofessional Care 29: 131-137. https://doi.org/10.3109/13561820.2014.955910
21. Interprofessional Education Collaborative [IPEC]. (2016) Core competencies for interprofessional education collaborative practice: 2016 update. Washington, DC: Interprofessional Education Collaborative. Retrieved from: https://www.ipecollaborative.org/resources.html
22. Baldwin DC, Jr. (2006) Two faces of professionalism. In K. Parsi & Sheehan, M. N. (Eds.). Healing as a vocation: A medical professional primer (pp.103-118). Lanham, NY: Rowman & Littlefield.
23. Rosenblatt RA, Hart LG (2000) Physicians and rural America. Western Journal of Medicine 173: 348-351. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1071163/
24. Dow A, DiazGranados D, Mazmanian P, Retchin S (2014) An exploratory study of an assessment tool derived from the competencies of interprofessional education collaborative. Journal of Interprofessional Care 28: 299-304. https://doi.org/10.3109/13561820.2014.891573
25. Parsell G, Bligh J (1999) The development of a questionnaire to assess the readiness of health care students for interprofessional learning (RIPLS). Medical Education 33: 95-100. doi: 10.1046/j.1365-2923.1999.00298.x
26. Green B, Johnson C (2015) Interprofessional collaboration in research, education, and clinical practice: Working together for a better future. Journal of Chiropractic Education 29: 1-10. https://doi.org/10.7899/JCE-14-36
27. Kahaleh A, Danielson J, Franson K, Nuffer W, Umland E (2015) An interprofessional education panel on development, implementation, and assessment strategies. American Journal of Pharmaceutical Education 79: 78. https://doi.org/10.5688/ajpe79678
28. McFadyen AK, Webster V, Strachan K, Figgins E, Brown H, et al. (2005) The Readiness for Interprofessional Learning Scale: A possible more stable sub-scale model for the original version of RIPLS. Journal of Interprofessional Care 19: 595-603. https://doi.org/10.1080/13561820500430157
29. Hind M, Norman I, Cooper S, Gill E, Hilton R, et al. (2003) Interprofessional perceptions of health care students. Journal of Interprofessional Care 17: 21-34. https://doi.org/10.1080/1356182021000044120
30. Horsburgh M, Lamdin R, Williamson E (2001) Multiprofessional learning: The attitudes of medical, nursing and pharmacy students to shared learning. Medical Education 35: 876-883. doi: 10.1046/j.1365-2923.2001.00959.x
31. Morrison S, Boohan M, Moutray M, Jenkins J (2004) Developing pre-qualification interprofessional education for nursing and medical students: Sampling student attitudes to guide development. Nurse Education in Practice 4: 20–29. https://doi.org/10.1016/S1471-5953(03)00015-5
32. Reid R, Bruce D, Allstaff K, McLernon D (2006) Validating the Readiness for Interprofessional Learning Scale (RIPLS) in the postgraduate context: Are health care professionals ready for IPL? Medical Education 40: 415-422. doi: 10.1111/j.1365-2929.2006.02442.x
33. Kirwin J, Greenwood KC, Rico J, Nalliah R, DiVall M (2017) Interprofessional curbside consults to develop team communication and improve student achievement of learning outcomes. American Journal of Pharmaceutical Education 81: 15. Retrieved from http://www.ajpe.org/doi/pdf/10.5688/ajpe81115.