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Attitudes of Undergraduate Public Health and Health Science Students towards Interprofessional Education (IPE) at a California University

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Abstract

Introduction: The study revealed that many healthcare professional students begin their academic studies with positive and high expectations towards interprofessional collaborative studies. Unfortunately, students lose interest if their initial expectations are not met with consistent opportunities to enhance their communication skills and better understand the different healthcare professions. The study aimed to explore health science and public health students' attitudes toward IPE. The participants' backgrounds and demographics were used as the variations for the study. **Methods:** A pre-post semi-quantitative anonymous survey was designed to assess health science and public health undergraduate students' attitudes toward IPE. The reason for this design was to capture the participants' attitudes toward IPE at the start of a semester when they had no academic exposure to IPE. Qualtrics was used to collect the research data. A valid and reliable scale was used to measure attitudes toward IPE. A post-survey was included to measure the participants' change in attitude toward IPE during the semester. The goal was to measure the IPE curriculum effectiveness. There were 21 survey questions. The questions were divided into four validated subscales. The first seven questions (Questions 1 - 7) pertained to the participants' demographics s, such as gender, age, race, ethnicity, major field of study, and prior education. Questions 8, 9, 16, & 20 were designed to determine how the participants perceived their roles and responsibilities in their future healthcare careers. Each IPE attitude question's central tendency and demographic variations were measured. The correlation between demographics and IPE attitudes was measured. **Results:** The pre-survey had 192 participants, and the post-survey had 97 participants. The pre-survey had 87% of participants in the age group 17 - 25 years, while the post-survey had 82.5% in the same age group. Only 5.7% of the participants

were 36 years or older in the pre-survey and 9.3% in the post-survey. The participants were 80.70% female in the pre-survey and 85.6% in the post-survey. The largest healthcare career field concentration was nursing, with 42.7% and 45.4% in the pre- and post-surveys. The other three larger career fields were healthcare administration, community health education, and physician assistant. The participants' attitudes toward learning with different healthcare career students and becoming more effective members of a healthcare team increased from 4.36 (SD = 0.13) to 4.40 (SD = 0.17). Two negative IPE attitude questions showed an increased value: 1) The function of nursing therapists is mainly to provide support for doctors (3.51, SD = 0.19 to 3.12, SD = 0.24, p-value ≤ 0.004) and 2) Clinical and healthcare problem-solving skills could only be learned with students from the same career field (3.73, SD = 0.13 to 3.31, SD = 0.24, p-value ≤ 0.001). **Conclusion:** Interprofessional Education in an academic setting is essential to help healthcare students prepare and succeed in their future healthcare careers. The study results show that health science and public health students understand IPE and value academic exposure to the IPE process during their studies. Academic healthcare programs should continue integrating the IPE learning model and content throughout the student's academic journey. The variations in IPE attitude do not significantly vary based on demographics and healthcare career fields. This study only represents a sample size of the many healthcare careers. Interprofessional communication and collaboration are essential to the future healthcare delivery challenges we face. For this reason, IPE should be integrated into healthcare education for all health science and public health students. It is recommended that more research should be done on creative curriculum design to get students more engaged in various healthcare IPE learning activities.

Keywords

Interprofessional Education, IPE, Interprofessional Collaboration, IPC, Healthcare Education

1. Introduction

Interprofessional education (IPE) engages students from different healthcare professions to interact in the learning environment to improve their future career collaboration and quality of care [1]. Interprofessional education has become an integral part of the curriculum development of most health profession educational programs [2]. Interprofessional Education is a learning process in which students from two or more healthcare professions learn with, from, and about each other in a collaborative and quality-of-care setting [3]. A qualitative research study at California State University, Fresno's College of Health and Human Services and Valley Children's Healthcare [4], showed that an interprofessional educational Competency (IPEC) self-assessment tool could be helpful rating students and health professionals IPE competencies and perception of

IPE. It is recommended that a scaffolded learning approach is adopted to ensure healthcare students attain competence in all Interprofessional Education (IPE) core healthcare competencies when reaching their final year of study [5]. A curriculum with specific healthcare activities and assessment methods should be pack aged in an IPE model to provide a clear understanding of the different types of healthcare profession graduates that will graduate from the program. Interprofessional Collaboration (IPC) is defined as healthcare team members' understanding/valuing/using of team expertise, effective communication, identifying belongingness to enhance patient health outcomes by personal productivity, alongside completing "to-do" lists and managing priorities [6]. Quality of care and patient outcomes would improve significantly if the healthcare workforce were trained based on the core competencies of interprofessional practice [7]. The main benefit of the IPE approach during tertiary education is to introduce students to various healthcare professionals and teach them the fundamentals of team-based care delivery before they graduate rather than expecting entry-level healthcare professionals to learn the complexity of care teams when they start their health care career [8]. It was found fewer medical errors may occur if communication improves because different health professions understand each other better [9].

Healthcare team success contributes to reducing destructive stereotyping, enhancing the understanding of different healthcare professionals' roles and responsibilities, and increasing individual team members' confidence in their ability to function within a healthcare team. Unfortunately, it cannot be assumed that health professional students will automatically work together as a care team once they join the workforce. If it is expected for health care students to work in collaborative practice within a team, it makes sense to include IPE teamwork in the health professional curricula [10]. Exploring the most effective method of delivering IPE learning activities promotes future collaboration [11]. For this reason, integrating IPE into training curricula has become widely accepted by Higher Education Institutions (HEIs). However, integrating IPE into the curriculums of Higher Education Institutions has significant room for improvement [12]. Many healthcare institutes have not effectively integrated IPE into their curricula. Although we understand the importance of interprofessional education, the successful implantation is dependent on healthcare students being ready to embrace learning with, from, and about each other's healthcare professions. Medical students in Indonesia did not want to share their knowledge with other health professionals, and they opposed IPE [13]. However, another study by [14] found undergraduate healthcare students ready to embrace IPE and emphasized implementing shared learning. It was founded that using team-based learning (TBL) learning significantly increased their multi-professional group of medical students' readiness for interprofessional learning in an IPE program [15]. Sometimes the students' baseline IPE readiness could differ, which may influence the implementation of IPE programs [16].

Identifying student IPE readiness before implementing an interprofessional education process was revealed in most IPE studies because it influences the implantation of the IPE educational process [7] [10] [14] [16]. This research study differs from previous studies because it aimed to assess students in their first year of study before being exposed to interprofessional learning opportunities and then conduct a post-assessment for the students after they experienced three months of interprofessional learning opportunities. Introducing IPE learning from the start of healthcare students' professional education is recommended to maximize their readiness for interprofessional learning and professional identities [17] [18]. It is recommended that academic institutions integrate IPE into core education at three levels: micro (what individuals in the faculty can do); meso (what a faculty can promote); and macro (how academic institutions can exert its influence in the health education and practice system) [19].

2. Methodology

2.1. Context of IPE at a California State University

Teaching courses in the Department of Public Health and Health Science at California State University Sacramento tend to be discipline-specific and taught independently from other related departments. However, in recent years a premedical health science degree started, and multiple different healthcare career students ended up in the same courses. The new premedical health science degree created the opportunity to start IPE and interprofessional team activities in the different courses.

2.2. Study Population and Sample

During the Spring 2022 semester there were 380 undergraduate public health and health science students enroll in mix healthcare career courses. Using a confidence level of 95%, population size of 380 and a margin for error of 5% the ideal sample size was deter-mined to be 192 participants. The online Qualtrics research sample size calculator was used to determine the ideal sample size for the study. The study included 192 pre-survey survey participants and 97 post-survey participants. The total participant population was 289.

Students were not required to enter their names or student numbers on the forms to ensure their anonymity in the study. Each form was assigned a participant number for the researcher to keep track of the data while entering it into the database for analysis purposes. The researchers negotiated with individual departments to gain access to the students, who were also ensured anonymity should they volunteer to participate in the study. The students were given time to participate in the study after the end of their lectures. Students choosing not to participate were allowed to leave the classroom. The process ensured voluntary participation in the study. The pre-survey and post-survey were set up as confidential online Qualtrics surveys.

3. Design & Methods

The anonymous semi-quantitative pre-survey and post-survey were developed to assess undergraduate public health and health science students' attitudes toward IPE. The reason for this design was to capture the participants' attitudes toward IPE when they had no academic exposure to IPE and at the start of a semester. The pre-survey was designed to capture the participants IPE attitudes and understanding before they start their Spring 2022 course. While post-survey was aimed to capture the participants change in attitudes and understanding of IPE during the semester. The results were to measure the effectiveness of the program IPE curriculum.

3.1. Method

The study evaluated pre- and post-measures through semi-quantitative surveys completed by undergraduate public health and health science students in courses in Public Health Department at California State University, Sacramento.

Ethical considerations

This study was approved by the Institutional Review Board (IRB) of California State University, Sacramento. The IRB number was Cayuse-21-22-50.

Setting

The pre-survey was conducted within the first week of Spring 2022 semester 24th January-28th January. The ideal participant size was obtained during this period. The post-survey was conducted within the last week of Spring 2022 semester May 9th-May 13th. The pre- and post-survey questions were the same for consistency and comparison. The surveys were conducted anonymously and were built in Qualtrics. In total, there were 21 survey questions. The questions were divided into four validated subscales. The first seven questions (Questions 1 - 7) pertained to the demographics of the students, such as gender, age, race, ethnicity, major field of study, and prior education.

Questions 8, 9, 16, & 20 were formulated to determine how students perceive their role and responsibilities in their future healthcare positions. The questions asked about the participants' future career field and if they have any previous healthcare work experience and participant were asked if they agree or disagree about the function of nurses and therapists' supporting roles. Question 16 asked the participants if they think clinical and healthcare problem-solving skills are best achieved if the same healthcare fields are studying together.

Questions 12, 13, 14, & 17 explored the participants' perceptions towards teamwork and collaboration. These questions explored the participants' attitudes towards studying communications skills, team-work skills together in an IPE learning environment.

Questions 10, 11, 15, 18, 19, & 21 were focused on the participants' attitude towards IPE. The questions include topics on how to become an effective member of a healthcare team, how to students can increase their ability to understand clinical problems, the benefit of IPE small group projects, and the necessity of

undergraduate health care students learn together.

The Qualtrics Survey (Appendix A) is attached as a reference.

Data Collection Procedure

A total of 192 students participated in the pre-survey, and a total of 97 students participated in the post-survey. The survey was distributed to courses in the Public Health Department that had students from different healthcare backgrounds. The courses were Fundamentals of Safety and Health—PUBH 100, Human Ecology and Health—PUBH 114, Public Health Administration & Policy—PUBH 116, Health Psychology—PUBH 122, Aging and Health—PUBH 150, & Introduction to the US Healthcare System—PUBH 151. The survey was anonymous and distributed through Canvas; no personal identifiers were collected. There were no penalties for non-participation or any incentives for participation. The participants were provided access to the Qualtrics Survey for a couple of weeks. They were instructed to complete the survey only once if they were in multiple classes where the survey was distributed. The survey participation was completely voluntary. The participants were free to decide whether they wanted to participate or not. The participants had the right to withdraw from the study at any point during the study and stop answering any question(s). The pre-survey was distributed at the start of the semester and the post-survey was distributed at the end of the semester before the final's week.

Data collection tools

Questions from the RIPLS questionnaire were used to formulate the pre-post survey. The original Readiness for Interprofessional Learning Survey (RIPLS) questionnaire was used. The RIPLS questionnaire is a self-reporting tool designed to assess the perceptions of healthcare students' skills, academic knowledge, and attitudes toward readiness to learn within healthcare multi-professionals' environment [20]. The questionnaire is internationally recognized as a survey tool, and it has been validated for use in IPE studies [21]. The 5-point Likert scale was used as the response to 12 of the questions: 1) Strongly disagree; 2) Disagree; 3) Neither agree nor disagree; 4) Agree; 5) Strongly agree. Two questions were set up for a yes or no answer. For the demographic's questions, options supplemented with text responses were used.

3.2. Data Analysis

Data from the pre-post Qualtrics survey was captured and analyzed using IBM Statistical Package for the Social Sciences (SPSS) software. The questionnaire in this research study was analyzed by exploratory and inferential data analyses. Within exploratory data analysis, descriptive statistics were included to clarify the findings. With regards to the inferential analysis, the t-test was used, which is appropriate as it compares the means of two sample groups, in this case.

For each of the demographic variables, the number of cases, and frequencies and valid percentages were calculated. For each of the 19 quantitative components of the tool, the mean and standard deviation were calculated. An overall

score of readiness was calculated (1 through 19), along with scores for each of the 3 subscales of the tool: Teamwork and collaboration (1 through 9), Professional identity (10 through 16), and Roles and responsibilities (17 through 19). Additional scores were calculated for the two segments of the Teamwork and collaboration subscale: Acquisition and effectiveness of team working skills (1 through 6), and Need for positive relationships between professionals and other healthcare students (7 through 9), and for the two segments of the Professional identity subscale: Negative (10 through 12) and Positive (13 through 16). The validity tests of Cronbach's Alpha and the Principal Component Analysis (PCA) were performed to check the adapted tool's internal consistency and external variance. For the inferential analyses, to select the appropriate tests, a test of normality was conducted for the data of each of the 19 components and for all eight scores (overall, 3 subscales, and 2 segments within each of 2 of the subscales). The data of each of the 19 components, independently, and all the scores, turned out to be not normally distributed. Accordingly, Mann-Whitney tests were used to compare the scores and each component independently, pre- and post-intervention. The scores and each component independently were compared across the demographic variables, as well: Age, Gender, and Discipline. For the dichotomous variable: Gender, Mann-Whitney test was used. As for the other two demographic variables, Kruskal-Wallis tests were conducted.

4. Results

Demographic Information

The study included 192 pre-survey survey participants and 97 post-survey participants. The total participant population was 289. Sixty percent of the participants were health science majors, and forty percent were public health majors. Table 1 shows more than 50% of the participants were registered as juniors for the Spring 2022 academic year. Eighty-seven percent of the participants were between the ages of 17 and 25. Slightly more than 80% of the participants were female. Thirty-six percent of the participants were Latino or His-panic, 30% were Asian, 11.5% were African-American, and 18.2% were Caucasian. Twelve percent of the participants had more than 2000 paid hours of healthcare experience, 16% had some paid healthcare experience, 24.5% had a healthcare volunteer position at some time, and 47.4% had no prior healthcare career experience. The participant healthcare career fields included the following disciplines: Nursing 44%, Healthcare Administration 13.5%, Community Health Education 13.5%, Physician Assistant 9%, Medical Doctor (MD)/Doctor of Osteopathic Medicine (DO) 3%, Physical Therapy 2.5%, and there was also a couple of Forensic Psychology, Dentistry, Pediatric, Firefighter/Paramedic and Pharmacy participants.

Table 1 shows the pre-survey participants' age was 87% in the age group 17 - 25 years, while the post-survey had 82.5% in the same age group. Only 5.7% were 36 years or older in the pre-survey and 9.3% in the post-survey. The

gender composition was 80.70% female in the pre-survey and 85.6% in the post-survey. Hispanic and Latino students were 34.9% in the pre-survey and 37.1% post-survey. Asian students were 30.2% and 36.10% in the pre-and post-survey. Black students were 11.5% and 8.2% in the pre-and post-survey, while White/European students were 17.7 and 15.5% in the pre-and post-survey.

Table 1 shows the largest healthcare career field was nursing, with 42.7% and 45.4% in the two surveys. Healthcare administration, community health education, and physician assistant were the other three larger career fields. The majority of students, 47.4% pre-survey and 38.1% post-survey, did not have prior healthcare experience. 24.5% pre-survey and 22.7% post-survey students had some healthcare volunteer experience. Only 28.1% pre-survey and 39.2% post-survey had prior healthcare work experience.

Questions that showed a significant difference between pre- and post-survey:

Table 2 shows the results of the participants' answers to the question if clinical and healthcare problem-solving skills should be learned with students from the same career field significantly changed from the pre-survey to the post-survey ($p = 0.001$). The participants started their courses with the attitudes that it is better for healthcare students from the same career field to learn problem-solving skills together rather than in a setting with other healthcare career fields. During the duration of the course the attitudes of the participants changed significantly to reflex a better understanding of the benefits of multiple healthcare career fields learning problem-solving skills together in an IPE setting. Table Clinical & healthcare problem-solving skills can only be learned with students from the same career field (pre-test: 3.73, post-test: 3.31, p-value: <0.001).

The data also revealed the student participants initially did not agree that the function of nurses and therapist is more than just to provide support for doctors. During the semester and course lectures the participants attitudes changes with a significant value ($p = 0.004$) to agree that the function of nurses and therapists is more than just to provide support for doctors. The function of nurses and therapists is mainly to provide support for doctors (pre-test: 3.51, post-test: 3.12, p-value: 0.004).

No significant change in attitudes for the other eleven pre-survey and post-survey answers was note.

Did prior academic education make a difference in students' attitudes towards IPE (Table 3) in the pre-survey? The pre-survey did not show the students with prior education had a significantly different attitude towards IPE than students with no prior education. The differences between the attitudes towards IPE for students in different levels of healthcare career experience were measured. The was no significant differences in the attitudes of students with no healthcare career experience, volunteer experience, prior paid healthcare work experience and students with more than 2000 paid hours of healthcare experience in the pre-survey answers.

Table 1. Output of decriptive analysis of demographics data.

Questions	Pre (N = 192)	Post (N = 97)
Please select your age category?		
17 - 25	87.00%	82.50%
26 - 30	5.20%	7.20%
31 - 35	2.10%	1.00%
36 - 40	3.10%	5.20%
Greater than 41	2.60%	4.10%
Which best describes your gender? Choose all that apply?		
Woman	80.70%	85.60%
Man	18.80%	13.40%
Non-binary	0.50%	1.00%
Are you Hispanic, Latino?—Selected Choice		
Yes	34.90%	37.10%
No	63.50%	62.90%
Unsure	0.50%	0%
Prefer not to answer	1.00%	0%
What race are you?		
Asian	30.20%	36.10%
African/Black	11.50%	8.20%
Hispanic/Latinx	29.70%	30.90%
Middle Eastern/North Africa	3.60%	1.00%
Native Hawaiian/Pacific Islander	2.10%	1.00%
White/European	17.70%	15.50%
Other	4.20%	6.20%
Prefer not to answer	1.00%	1.00%
What is your future health care career field?		
Healthcare Administration	13.50%	13.40%
Community Health Education	13.50%	13.40%
Occupational Health & Safety	3.10%	3.10%
Nursing	42.70%	45.40%
Medical Doctor (MD or DO)	3.10%	3.10%
Physician Assistant	8.90%	10.30%
Physical Therapy	2.60%	1.00%
Pharmacy	0.50%	0.00%
Other	12.00%	10.30%
Do you have prior healthcare experience?		
No	47.40%	38.10%
Yes, as volunteer	24.50%	22.70%
Yes, prior paid work in healthcare	16.10%	22.70%
Yes, more than 2000 paid hours healthcare experience	12.00%	16.50%

Table 2. Pre- and Post-survey results (95% confidence limits).

Questions	Pre (N = 192)	Post (N = 97)	p-value
Learning with different health care career students will help me become a more effective member of a health care team.	4.36 ± 0.13	4.40 ± 0.17	0.694
Patients would ultimately benefit if health-care students worked together to solve patient problems.	4.38 ± 0.10	4.53 ± 0.11	0.770
Shared learning with other health-care students will increase my ability to understand clinical problems.	4.44 ± 0.10	4.49 ± 0.13	0.531
Communication skills should be learned with other health care students.	4.41 ± 0.10	4.36 ± 0.15	0.617
Shared learning will help me to think positively about other health care professionals.	4.23 ± 0.12	4.37 ± 0.14	0.152
Team-working skills are essential for all health care students to learn.	4.54 ± 0.11	4.61 ± 0.11	0.421
It is necessary for undergraduate health care students to learn together.	3.88 ± 0.13	3.77 ± 0.23	0.409
Clinical & health care problem-solving skills should be learned with students from the same career field.	3.73 ± 0.13	3.31 ± 0.24	0.001
Shared learning with other health care career students will help me to communicate better with patients and other health care professionals.	4.22 ± 0.11	4.27 ± 0.13	0.623
I would welcome the opportunity to work on small-group projects with other health care career students.	3.98 ± 0.12	4.15 ± 0.16	0.091
Interprofessional shared learning will help to clarify the nature of patient problems.	4.03 ± 0.10	4.11 ± 0.13	0.316
The function of nurses and therapists is more than just to provide support for doctors.	3.51 ± 0.19	3.12 ± 0.24	0.004
I don't have to acquire much more knowledge and skills than other health career students.	2.92 ± 0.13	2.72 ± 0.20	0.095

Table 3. Pre-test survey result by student demographics.

	Did you earn another degree?		Do you have prior healthcare experience?			
Questions	Yes	No	No	Yes, as volunteer	Yes, prior paid work in healthcare	Yes, more than 2000 paid hours healthcare experience
Learning with different health care career students will help me become a more effective member of a health care team.	4.53 ± 0.20	4.31 ± 0.14	4.40 ± 0.19	4.28 ± 0.23	4.35 ± 0.28	4.39 ± 0.41
Patients would ultimately benefit if health-care students worked together to solve patient problems.	4.42 ± 0.20	4.36 ± 0.12	4.32 ± 0.27	4.4 ± 0.17	4.45 ± 0.23	4.43 ± 0.32
Shared learning with other health-care students will increase my ability to understand clinical problems.	4.47 ± 0.17	4.44 ± 0.11	4.41 ± 0.15	4.49 ± 0.9	4.42 ± 0.25	4.52 ± 0.26
Communication skills should be learned with other health care students.	4.42 ± 0.2	4.34 ± 0.12	4.34 ± 0.17	4.43 ± 0.19	4.52 ± 0.21	4.48 ± 0.31
Shared learning will help me to think positively about other health care professionals.	4.27 ± 0.22	4.22 ± 0.14	4.21 ± 0.18	4.13 ± 0.26	4.45 ± 0.21	4.22 ± 0.34
Team-working skills are essential for all health care students to learn.	4.49 ± 0.22	4.55 ± 0.13	4.49 ± 0.18	4.66 ± 0.21	4.58 ± 0.18	4.39 ± 0.39
It is necessary for undergraduate health care students to learn together..	3.87 ± 0.27	3.88 ± 0.15	3.97 ± 0.17	3.77 ± 0.28	3.77 ± 0.21	3.87 ± 0.46

Continued

Clinical & health care problem-solving skills should be learned with students from the same career field.	3.87 ± 0.26	3.69 ± 0.15	3.77 ± 0.16	3.53 ± 0.31	3.81 ± 0.36	3.91 ± 0.28
Shared learning with other health care career students will help me to communicate better with patients and other health care professionals.	4.22 ± 0.21	4.22 ± 0.13	4.20 ± 0.15	4.19 ± 0.25	4.29 ± 0.25	4.30 ± 0.31
I would welcome the opportunity to work on small-group projects with other health care career students.	3.71 ± 0.29	4.06 ± 0.13	4.05 ± 0.15	3.91 ± 0.27	3.90 ± 0.39	3.91 ± 0.45
Interprofessional shared learning will help to clarify the nature of patient problems.	4.13 ± 0.18	4.00 ± 0.11	3.98 ± 0.16	4.00 ± 0.16	4.06 ± 0.21	4.26 ± 0.27
The function of nurses and therapists is more than just to provide support for doctors.	3.62 ± 0.30	3.47 ± 0.16	3.36 ± 0.20	3.60 ± 0.27	3.65 ± 0.41	3.87 ± 0.50
I don't have to acquire much more knowledge and skills than other health career students.	2.93 ± 0.29	2.91 ± 0.15	2.97 ± 0.21	2.83 ± 0.34	2.94 ± 0.17	2.87 ± 0.40

Did prior academic education make a difference in students' attitudes towards IPE (Table 4) in the post-survey. The post-survey data measured if the course teaching changed the attitudes of the students during the semester. Although small changes were noted when analyzing the data none of the changes in attitude towards IPE can be considered significant the two academic education groups. The four different healthcare career experience groups also did not show significant changes in their attitudes towards IPE.

5. Discussion

The study findings revealed various key results, which focused on students' positive attitude towards IPE and their willingness to collaborate. The relatively low level of participant exposure to IPE made the study results valuable material. Most findings from current studies showed that healthcare students valued collaborative learning with other healthcare professional students and shared their experiences with each other within an academic setting. Most studies have found that healthcare students have a generally positive attitude towards interprofessional education [22] [23]. The current study revealed that IPE education exposure in the academic program has minimal impact on the student's readiness to engage in cross-disciplinary learning and collaborations. An IPE Intervention strategy may constitute better results. The process would need faculty engagement with efforts directed toward building the IPE curriculum development in the health science and public health programs. The significance of IPE needs to be endorsed, and the IPE competencies need to deliver via proactively developed. During 2012-2013 the United States had an extensive faculty development process in place to prepare faculty for IPE. The process was evidence-based, and the lessons learned were shared with colleagues. The assessment of IPE should ideally be broken down into teamwork competencies, team/collective orientation, shared mental models, mutual trust, and closed-loop communication [7]. Some behavioral examples for the competencies can be facilitating team prob-

lem-solving, providing performance expectations and acceptable interaction patterns, synchronizing, and combining individual team member contributions, seeking, and evaluating information that impacts team functioning, clarifying team member roles, and engaging in preparatory meetings and feedback sessions with the team [7].

Table 4. Post-test survey result by student demographics.

Item	Did you earn another degree?		Do you have prior healthcare experience?			
	Yes	No	No	Yes, as volunteer	Yes, prior paid work in healthcare	Yes, more than 2000 paid hours healthcare experience
	(N = 18)	(N = 79)	(N = 37)	(N = 22)	(N = 22)	(N = 16)
Learning with different health care career students will help me become a more effective member of a health care team.	4.44 ± 0.34	4.39 ± 0.19	4.51 ± 0.22	4.14 ± 0.44	4.32 ± 0.29	4.63 ± 0.42
Patients would ultimately benefit if health-care students worked together to solve patient problems.	4.56 ± 0.25	4.52 ± 0.23	4.62 ± 0.20	4.41 ± 0.22	4.45 ± 0.27	4.56 ± 0.34
Shared learning with other health-care students will increase my ability to understand clinical problems.	4.33 ± 0.34	4.53 ± 0.12	4.51 ± 0.22	4.36 ± 0.30	4.50 ± 0.23	4.63 ± 0.32
Communication skills should be learned with other health care students.	4.06 ± 0.43	4.43 ± 0.25	4.30 ± 0.28	4.27 ± 0.28	4.50 ± 0.26	4.44 ± 0.39
Shared learning will help me to think positively about other health care professionals.	4.11 ± 0.42	4.43 ± 0.25	4.41 ± 0.21	4.14 ± 0.37	4.55 ± 0.26	4.38 ± 0.36
Team-working skills are essential for all health care students to learn.	4.50 ± 0.31	4.63 ± 0.13	4.62 ± 0.18	4.55 ± 0.29	4.59 ± 0.22	4.69 ± 0.32
It is necessary for undergraduate health care students to learn together.	3.78 ± 0.53	3.77 ± 0.26	4.08 ± 0.28	3.55 ± 0.50	3.50 ± 0.53	3.75 ± 0.77
Clinical & health care problem-solving skills should be learned with students from the same career field.	3.17 ± 0.02	3.34 ± 0.27	3.54 ± 0.34	3.09 ± 0.47	3.05 ± 0.55	3.44 ± 0.72
Shared learning with other health care career students will help me to communicate better with patients and other health care professionals.	4.17 ± 0.35	4.29 ± 0.15	4.32 ± 0.21	4.00 ± 0.27	4.32 ± 0.25	4.44 ± 0.47
I would welcome the opportunity to work on small-group projects with other health care career students.	4.06 ± 0.29	4.18 ± 0.18	4.16 ± 0.23	4.00 ± 0.34	4.23 ± 0.33	4.25 ± 0.60
Interprofessional shared learning will help to clarify the nature of patient problems	4.00 ± 0.34	4.14 ± 0.14	4.11 ± 0.17	3.91 ± 0.30	4.18 ± 0.26	3.89 ± 0.44
The function of nurses and therapists is more than just to provide support for doctors.	3.44 ± 0.55	3.05 ± 0.27	3.03 ± 0.39	3.45 ± 0.38	2.95 ± 0.59	3.13 ± 0.69
I don't have to acquire much more knowledge and skills than other health career students.	2.67 ± 0.56	2.73 ± 0.21	2.89 ± 0.33	2.73 ± 0.41	2.86 ± 0.40	2.13 ± 0.47

6. Conclusion

Students who understand IPE and practice these skills in their academic setting will be better prepared for their future healthcare careers. The project results demonstrate an understanding of IPE by public health and health science students and the need for academic healthcare programs to continue integrating IPE structure and content throughout the student's academic journey. While variations in IPE attitude did not significantly vary based on background, this project only represents a small sample of future healthcare professionals. Collaboration is key to successful healthcare delivery; therefore, it must be brought to the forefront in academics for all public health and health science students. It is noted that there are some areas where more research needs to create more creative and engaging health care IPE learning activities.

7. Implications for Practice

During the past few decades, IPE has been established to meet the demand for effective collaboration in healthcare practice, aiming to improve health outcomes for public health, communities, and individual patients. With the use of IPE, health professionals are able to contribute to healthcare in a collaborative effort. However, a more strategic approach is required when partnering with health education, and IPE educational research into the effectiveness of IPE is essential [24]. The findings of this study help to fill the literature gap in identifying the potential for interprofessional educational collaboration through preparing graduate students adequately to work interprofessionally. The study provides important evidence for health educators and professional health policymakers to understand how interprofessional education and collaboration can result in a more comprehensive approach to improving health outcomes, which can contribute to helping reform healthcare education curriculums and national/regional policy and practices. Triple-aim patient outcomes may be achieved with a better understanding of the impact that interprofessional education and collaborative practice (IPECP) have on healthcare providers, healthcare administrators, healthcare educators, and healthcare policymakers [25].

8. Limitations

This study aimed to determine how ready students were for interprofessional learning and whether this readiness improved during the semester the course was taught. One of the study's limitations was to track IPE readiness along the different course learning activities to identify the learning and teaching activities that contribute the most to students' readiness for IPE. Future studies could explore these health care learning activities and identify the IPE core competencies instrumental in preparation to ensure their readiness for collaborative practice as future health professionals.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this pa-

per.

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Appendix A

Research Qualtrics Survey Questions

Attitudes of undergraduate public health and health science students towards Interprofessional Education (IPE) at a California university.

Demographics

What is the Major for your bachelor's degree?

- o Public Health
- o Health Science
- o Gerontology
- o Biology

What is your current year of study?

- o Freshman
- o Sophomore
- o Junior
- o Senior

Age

- o 17 - 25
- o 26 - 30
- o 31 - 35
- o 36 - 40
- o Greater than 40

Which best describes your gender? Choose all that apply.

- o Woman
- o Man
- o Transgender
- o Non-binary
- o Not listed_____
- o Prefer not to answer

Are you Hispanic, Latino?

- o Yes
- o No
- o Unsure _____
- o Prefer not to answer

What race are you?

- o Asian
- o African/Black
- o Hispanic/Latinx
- o Middle Eastern/North Africa
- o Native American
- o Native Hawaiian/Pacific Islander
- o White/European
- o Race not mentioned _____
- o Prefer not to answer

Did you earn another degree?

- Yes
- No

Role & Responsibilities

What is your future healthcare career field?

- Medicine (MD or DO)
- Nursing
- Physician Assistant
- Dentistry
- Chiropractor
- Psychiatrist
- Pharmacy
- Physiotherapy
- Physical Therapy
- Nutrition
- Social Work
- Kinesiology
- Public Health
- Community Health Education
- Healthcare Administration
- Occupational Health & Safety
- Other

Do you have any previous or current work experience in the healthcare field?

- Yes
- No

Clinical & health care problem-solving skills can only be learned with students from the same career fields.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

The function of nurses and therapists is mainly to provide support for doctors.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Attitude towards IPE

Learning with different healthcare career students will help me become a more effective member of a healthcare team.

- Strongly Disagree

- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

Shared learning with other healthcare students will increase my ability to understand clinical problems.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

I would welcome the opportunity to work on small-group projects with other healthcare career students.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

It is not necessary for undergraduate healthcare students to learn together.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

Interprofessional shared learning will help to clarify the nature of patient problems.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

I have to acquire much more knowledge and skills than other health career students,

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

Teamwork & Collaboration

Communication skills should be learned with other health care students.

- o Strongly Disagree
- o Disagree
- o Neutral

- o Agree
- o Strongly Agree

Shared learning will help me to think positively about other healthcare professionals

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

Team-working skills are essential for all healthcare students to learn.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

It is not necessary for undergraduate healthcare students to learn together.

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree