



March 2021

### A comparison of live vs. asynchronous IPE in physical therapy and physician assistant students: a randomized cohort study

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#### Recommended Citation

McCallister, E., Weidman-Evans, E., Bernard, A., & Fort, A. (2021). A comparison of live vs. asynchronous IPE in physical therapy and physician assistant students: a randomized cohort study. *Online Journal of Interprofessional Health Promotion*, 3(1). Retrieved from <https://repository.ulm.edu/ojihp/vol3/iss1/1>

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## **A Comparison of Live vs. Asynchronous IPE in Physical Therapy and Physician Assistant Students: A Randomized Cohort Study**

Interprofessional education (IPE) is defined as “when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes” (World Health Organization, 2010). Healthcare education programs, such as the professions included in this study, are required by their accrediting bodies to include IPE activities as part of their educational curriculum (Accreditation Review Commission on Education for the Physician Assistant, 2019; Commission on Accreditation in Physical Therapy Education, 2017).

The Interprofessional Education Collaborative (IPEC) further defined core competencies in collaborative practice to help guide professional healthcare programs in developing IPE content. The core competencies fall under four overarching domains: values/ethics for interprofessional practice, roles/responsibilities, interprofessional communication, and teams/teamwork (Schmitt et al., 2011). IPE programming should address all domains during the didactic or clinical experiences. In this way, the student from one profession is prepared to work alongside other healthcare professionals to manage all aspects of a patient’s care plan.

Given the importance of IPE, the accrediting bodies for entry-level physician assistant (PA) and physical therapy (PT) educational programs require IPE as a standard for accreditation (Accreditation Review Commission on Education for the Physician Assistant, 2019; Commission on Accreditation in Physical Therapy Education, 2017). However, challenges have been identified that pose barriers to IPE (Brewer et al., 2017; Eccott et al., 2012; Giordano et al., 2012; Levy & Mathieson, 2017; Saini et al., 2011; Van Winkle et al., 2012). Therefore, the

purpose of this study was to investigate the effectiveness of an all-online (asynchronous) delivery of IPE to students in the PA and PT professions.

The research question was defined as: Will asynchronous delivery of IPE material affect healthcare students' scores on the Readiness for Interprofessional Learning Scale (RIPLS) differently than live delivery? The authors hypothesized that there would be no significant difference in the change in RIPLS scores between the two groups.

This comparison became even more relevant in the Spring of 2020, when COVID-19 forced many academic programs to move to largely virtual and/or asynchronous education. In addition, with the phased re-opening that is occurring in many states, schools are limiting the size and frequency of in-person class. These changes present a new challenge for IPE, which typically involves gathering large, diverse groups of students together for the IPE activity. While we did not initiate the study to address the impact of a global pandemic, the research question may provide educational programs with a valid alternative to traditional IPE.

### **Review of the Literature**

There have been many published studies that outline the challenges faced by educators in implementing IPE. Student attitudes towards IPE activities are variable and could impact outcomes of the activities. Physical space as well as finding time among the various programs are two additional challenges posed by in-person IPE activities (Brewer et al., 2017; Eccott et al., 2012; Giordano et al., 2012; Levy & Mathieson, 2017; Saini et al., 2011; Van Winkle et al., 2012). Therefore, the investigators sought an alternate, effective delivery method to address the time and space challenges to traditional in-person IPE.

It has been shown that asynchronous healthcare education, in general, can improve knowledge, skills, attitudes, and behaviors in healthcare education (Cook et al., 2008).

Furthermore, reviews showed that e-learning was an effective way to improve knowledge and attitudes about IPE, although not necessarily skills or behaviors (Collins et al., 2017; Manning & Pogorzelska-Maziarz, 2017; Reeves et al., 2013; Reeves et al., 2017; Smith et al., 2019). A pilot study conducted by the authors of this study support this conclusion (McCallister & Weidman-Evans, 2021). In the pilot study, all students participated in asynchronous IPE utilizing the same framework as in this randomized study showed that student attitudes regarding IPE started and remained highly favorable, and that the majority (83%) perceived that the objectives of the activity were achieved.

There are many resources describing different institutions' approach to, and providing guidance for, developing asynchronous IPE (Bartlett & Kinsey, 2020; Collins et al., 2017; Evans, Knight, et al., 2020; Evans, Ward, et al., 2020; Fowler et al., 2018; Sanborn, 2016). However, there is a paucity of research comparing the outcomes of asynchronous and live IPE.

To determine the impact a specific IPE activity would have on student attitudes, the RIPLS was selected for use in both the pilot study and the randomized study detailed here, because it is a validated questionnaire [Cronbach alpha = 0.90] that is widely used and available for public use (Parsell et al., 1998). It assesses three domains: teamwork/collaboration; professional identity (positive and negative); and roles and responsibilities. The RIPLS is recommended for students early in their training, as opposed to other tools that are more useful later in clinical curricula, thus making it applicable to the students included in these studies (Lie et al., 2013). In addition, it is clear and relatively short, so does not require a significant time commitment for research participants to complete. The version of the RIPLS used in this study is shown in Appendix B. While this tool has some limitations, which are outlined in the Discussion section below, the investigators believed that it would be useful in the comparison of two

methods of IPE delivery based on these factors, when analyzed as described below (Schmitz & Brandt, 2015).

Based on the necessity of IPE in healthcare education and the challenges faced when it is done traditionally (“live”), the investigators sought to determine an effective, viable alternative delivery method. With evidence that asynchronous education is effective at improving knowledge in both students and healthcare workers, the development of an asynchronous model for IPE delivery seemed logical. However, the investigators wanted to ensure that it was both viable and as effective as traditional, live IPE.

## **Materials and methods**

### **Research Design**

This is a randomized cohort study examining changes in PA and PT students’ RIPLS scores before and after participation in an IPE activity. As a secondary aim, student perceptions of the IPE activity were collected to determine if the activity objectives were met, student opinion of delivery method, and overall time spent per week on the activity. The study received LSU Health Shreveport Institutional Review Board approval in December 2017 (study number 00000896). All students were randomized to either small “live” or “asynchronous” groups of 5-6 students for the IPE activity, with an equal number of PA and PT students distributed to each delivery method. The live groups met once per week to discuss the weekly assignment, while the asynchronous groups participated in Moodle® (Modular Object-Oriented Dynamic Learning Environment: an online educational platform used to provide a central interface for e-learning) forum discussions on the same weekly assignment.

Participation in the IPE activity was mandatory for all PA and PT students as part of their classwork for the semester. Participation in the research component of the IPE activity was not

mandatory, and all communication regarding the research component clearly stated that participation in the data collection was anonymous and would not impact the student's grade in a class or on the IPE activity. The IPE activity was conducted over four weeks. Each week, both the live and asynchronous groups were assigned a portion of a patient case to analyze and discuss with their interprofessional classmates. The same module (instructions, case information, and discussion questions) were provided to each group. The live groups met in a classroom and were moderated by one of the four authors. The asynchronous groups were moderated throughout the week by two of the authors via discussion boards in Moodle, the institution's learning management system. All students were required to turn in the same reflection papers and were graded on participation using the same standards as their professional cohort.

Each weekly module was designed to teach and assess a core domain of IPE, as defined by the IPEC (Schmitt et al., 2011). Table 1 describes each weekly module, its learning objective, and associated IPEC domain. The assigned case, resulting discussion, and reflective writing were the same for both groups.

**Table 1***Description of Weekly IPE Activity's Focus with Associated Learning Object and Domain*

<b>Week</b>	<b>Module Content</b>	<b>Learning Objective</b>	<b>IPEC Domain</b>
1	Discussion of professional curricula, training and roles/responsibilities	Compare and contrast the educational requirements of PA's and PT's	Roles & Responsibilities
2	Dissemination of diabetic wound case. Development of diagnosis. Compare and contrast between professions	Compare and contrast professional roles in the care of a patient with the assigned condition	Roles & Responsibilities, Teams & Teamwork
3	Development of a treatment plan. Compare and contrast between professions	Appropriately manage a patient presenting with the assigned condition within the purview of one's own profession	Roles & Responsibilities, Teams & Teamwork
4	Prepare documentation of patient "encounter". Compare and contrast between professions	Document patient care in a way that clearly communicates to other professions the care that was provided	Interprofessional Communication

*Note:* IPEC, Interprofessional Education Collaborative. PA, Physician Assistant. PT, Physical Therapist.

The facilitators were familiar with the objectives for each weekly activity. Both the live and asynchronous facilitators participated in group discussions by asking questions to draw out more information or to encourage the participants to probe deeper. The asynchronous facilitation took place throughout the week as the discussions developed, which differed from the live moderation that was limited to the class meeting time. Moderators did not discuss whether the objectives were met with each other or the students until the end of the data collection to avoid biasing the results.

### **Subjects**

All first-year PA (n=76 total; 37 in 2018 and 39 in 2019) and PT students (n=72 total; 36 per cohort) enrolled in the fall 2018 and 2019 semesters were eligible to participate in the study.

Each year, the students were randomized on a 1:1 basis to complete the same mandatory IPE activity either live or asynchronously.

In order to achieve meaningful results, the study was conducted over two years. An *a priori* sample size determination was conducted using G\*Power 3, (Faul et al., 2007) based upon the change in RIPLS score from the investigators' pilot study. It was determined that 90% participation (n=133 matched pairs) would result in approximately 75% power to detect a change in overall RIPLS score for the entire cohort ( $\alpha=0.05$ ).

### **Data Collection**

Prior to beginning week one of the IPE activity, an anonymous survey that contained the Readiness for Interprofessional Learning Scale (RIPLS) questionnaire was sent to all students to establish pre-activity scores. The RIPLS was not mandatory, as it was part of the research component of the activity. Students electing to participate gave consent electronically, then proceeded to complete the questionnaire using a 4-digit identifier chosen by them as their personal ID. The letter emphasized that research participation was not mandatory, and would not be part of the grade for any class or for the IPE activity. All survey data were collected using Google Forms.

After the last week of the IPE experience, students received a link to a second survey, requesting the same 4-digit ID used previously. Consenting students then completed the RIPLS again and answered questions regarding their perception of whether or not the educational objectives of the activity were met, which method of IPE delivery they believed they preferred, and how much time they spent weekly on the activity. All students were invited to fill out both pre- and post-activity surveys, but only ID-matched pairs were used for data analysis.

### **Data Reduction and Analysis**



The primary outcome of this study was to compare the change in students' attitudes towards interprofessional collaboration, measured before and after either a live or asynchronous delivery of an IPE activity. The same comparison was made between professions and cohorts to ensure there was no bias from either characteristic. In addition, to improve the reliability of the results, the pre- and post-activity scores were compared within groups. Data were downloaded from the Google Form into Microsoft Excel (Excel 2004). Data could be tracked to the year of participation (2018 or 2019), as well as to profession (PA or PT student). Data without a pre- or post-activity match were discarded from the primary analysis. If a survey was not filled out completely, it was removed from analysis. Changes in both overall RIPLS score and individual domains were analyzed using paired t-tests; differences within groups were analyzed using an independent samples t-test.

To determine the perceived effectiveness of the activities, the proportion of students who felt that individual educational objectives for the activity were met "well" or "very well" (versus "neutral" or "not well") was compared between the asynchronous and live groups using Chi-squared test, as was the amount of time spent on the activity between groups. The authors felt that the positive nature of the "well" and "very well" responses would affirm that the objectives were met. The objectives were constructed to reflect one or more IPEC domain, and the weekly activity was designed to meet the weekly objective. Again, this information is summarized in Table 1.

### **Results**

The surveys collected a total of 74 matched response pairs. Total RIPLS score data were evaluated for skewness and kurtosis, and was determined to be normally distributed with one significant outlier. The outlier was 8.9 standard deviations from the mean change, and was

therefore omitted from the analysis for a total n=73 (response rate 49.3%). Table 2 outlines the participant characteristics; due to the small, close-knit nature of both programs, more detailed demographic data were deemed at risk for de-identifying students.

**Table 2**

*Demographic Characteristics of The Study Participants*

Characteristic	Frequency (n=73)
Identified gender	
Female	62
Male	11
Non-binary	0
Prefer not to state	0
Age range	
20-24	67
25-29	3
30-34	2
>35	1
IPE group	
Live	38
Asynchronous	35
Professional program	
Physician Assistant	32
Physical Therapy	41
Cohort	
2018	30
2019	43

There were no significant differences in pre-activity RIPLS score between delivery method, profession, or cohort. There were also no significant differences in the post-activity RIPLS score between delivery method or cohort; however, there was a difference between professions. Table 3 summarizes these data.

**Table 3**

*Comparison of Pre- and Post-Activity Total RIPLS Scores Between Delivery Method, Profession, And Cohort*

	<b>Pre-Activity RIPLS Score</b>	<b>p-value</b>	<b>Post-Activity RIPLS Score</b>	<b>p-value</b>
<b>Live Delivery</b>	82.92	0.70	83.00	0.85
<b>Asynchronous Delivery</b>	83.66		83.34	
<b>Physician Assistant Student</b>	82.25	0.37	80.41	0.03 <sup>a</sup>
<b>Physical Therapy Student</b>	84.07		85.32	
<b>2018 Cohort</b>	82.23	0.38	80.53	0.09
<b>2019 Cohort</b>	84		85.00	

Note: <sup>a</sup> Statistically significant for  $\alpha \leq 0.05$

### **Primary Outcome**

There was no statistically significant change between pre- and post-activity total RIPLS scores ( $p=0.88$ ). There was no significant difference in the change in the total RIPLS score or scores on any sub-scale between the live and asynchronous groups. There also was no difference in the change in RIPLS scores when comparing the two cohorts (2018 vs. 2019). There was,

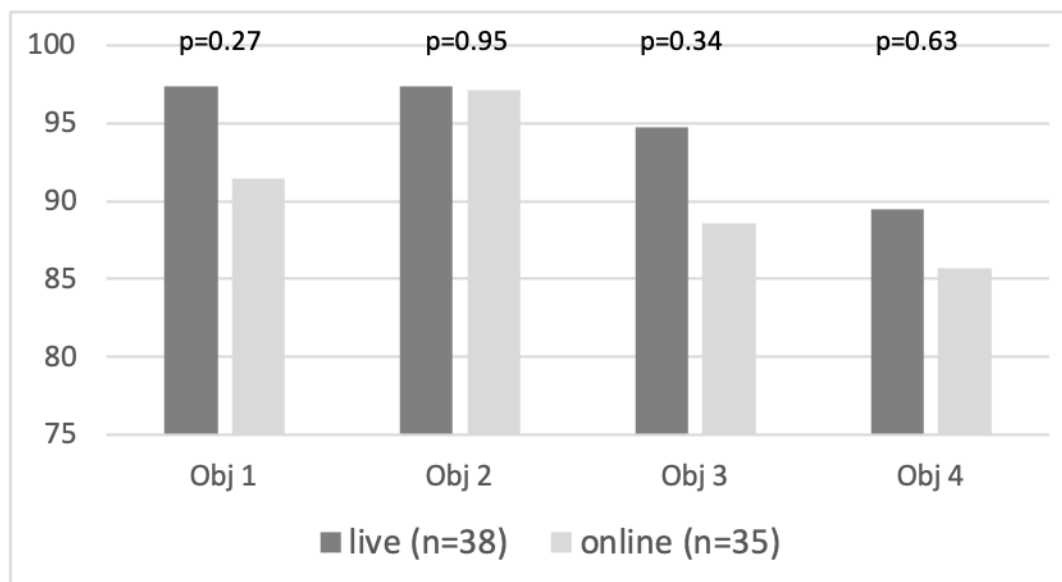
however, a small but statistically significant difference between the two professions on the change in total RIPLS score and the Roles/Responsibilities sub-scale. Appendix A provides a detailed list of these comparisons.

### Secondary Outcomes

The authors used student ratings to evaluate if the activity met the predetermined objectives. A high proportion of students perceived each of the objectives as being attained “well” or “very well”: 94% for objective 1; 97% for objective 2; 92% for objective 3; and 89% for objective 4. There was no significant difference in student perception of achievement of any objectives between the live and asynchronous groups, as illustrated in Figure 1.

**Figure 1**

*Student Perception Of Achievement Of Objectives (% Of Respondents)*



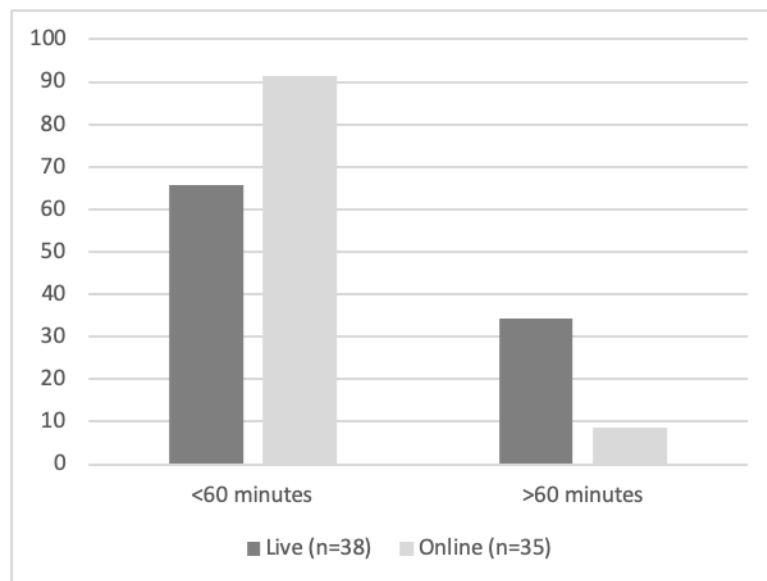
*Note:* A comparison of the percent of students in the live and online asynchronous groups who felt the IPE activity met each of the four pre-stated activity objectives.

Data were also collected on the time spent per week on the IPE activity, and on participants’ preferred method of IPE activity delivery. Figure 2 illustrates the amount of time

spent by each IPE type. Those in the “live” group were significantly more likely to spend more than 60 minutes each week on the activity ( $p=0.02$ ).

## Figure 2

*Time Spent On Activities (% Of Respondents)*



*Note:* A comparison of the number of students in the live and online asynchronous groups who spent less than 60 minutes and more than 60 minutes on each weekly activity. The students in the live activity were more likely to spend longer on the activity each week than the asynchronous students ( $p=.02$ ).

Sixty-one students (83.5%) noted a preference in delivery method. Forty-six (75%) of those preferred the type of IPE to which they were assigned ( $p<0.001$ ).

## Discussion

There was no significant difference in the change in RIPLS scores between the two delivery methods, suggesting equivalence in attitudes towards interprofessional learning between the two methods. Neither delivery method significantly improved the RIPLS scores. This is consistent with other published studies that showed minimal to no change in the RIPLS scores

post-IPE, especially when the baseline score was high, as it was in this study (Chu, 2016; Segal-Gidan et al., 2014). There also was no difference in the students' perceptions of how well the instructional objectives were achieved. Based upon these findings, the authors conclude that asynchronous delivery in a case-based discussion format may be a viable, effective option to develop healthcare students' IPE knowledge.

In addition to analyzing the difference in change scores between delivery methods, the authors were interested in differences between the professions and between the two cohorts. While there were no differences at any time between the two cohorts, there was a significant difference between the PA and PT professions' post-activity total RIPLS score (80.61 vs 85.15;  $p=0.03$ ), as well as their changes in score on the total RIPLS score (-1.84 vs. 1.24;  $p=0.04$ ) and on the Roles/Responsibilities sub-scale (-0.15 vs. 0.65;  $p=.03$ ). Previous studies have found similar trends in the PA student population, but no cause has yet to be identified (Hertweck et al., 2012; Smith & Anderson, 2018). The authors hypothesize the differences in this study may be due to differences in the two professions' schedules at the time of the final data collection. The semester in which the IPE activity occurred is typically seen as more stressful for the PA vs. PT students, which could result in more negative attitudes overall. That said, the change in total RIPLS scores is small and of questionable clinical relevance, and the sub-scale validity and reliability have been called into question in previous studies (Mahler et al., 2015; McFadyen et al., 2006; McFadyen et al., 2005). These findings decrease the impact of the difference in the scores.

While the change in RIPLS score allowed for overall comparison between the two groups, it does not provide information on the quality of an IPE activity. Therefore, the authors included questions described in the Methods section to evaluate the success of each delivery

method in meeting the IPE objectives. The large majority of students in both the live and asynchronous groups felt that the activity met the stated objectives, with no difference between delivery methods. As there were no significant differences between delivery methods for any objective, these findings reinforce the asynchronous method as an effective alternative to delivering case-based IPE learning.

Scheduling and overall time requirements are often cited as barriers to IPE participation. Participants were asked to estimate the amount of time per week they spent on the activity, and if they preferred a live or asynchronous delivery. Overall, there was a significant difference in time spent on the activity, with the live groups more likely to spend more time on the activity compared to the asynchronous groups (<60 minutes per week vs.  $\geq$ 60 minutes per week;  $p=.02$ ). In addition, participants preferred the delivery method they experienced ( $p<0.001$ ). Therefore, this study demonstrates that providing IPE in an asynchronous environment is more time-efficient and is the preferred method of delivery for students who experience the asynchronous delivery.

There were two major limitations of this study: use of RIPLS in a pre-/post- model and the lack of power related to the primary outcome. The RIPLS was not originally designed to measure changes in learner readiness/perceptions of IPE (Parsell et al., 1998). This was addressed by comparing the baseline and post-activity RIPLS scores using a t-test to determine if there was a difference between them at either time period. The results of this sub-analysis support the results that there was no significant difference in the change in scores between the two groups.

Some researchers posit that the validity of the RIPLS as a whole is questionable, as the questions are leading students to the socially or academically “right” response (Schmitz &

Brandt, 2015). Furthermore, the constructs being assessed in the subscales are so closely linked that the sub-scale reliability has been questioned (Mahler et al., 2015; McFadyen et al., 2006; McFadyen et al., 2005; Schmitz & Brandt, 2015). The authors acknowledge these possible limitations of the tool; however, we still felt that it was the most appropriate for this research based upon where it fell in the students' training and its ease of use.

A *post-hoc* power analysis showed a power of 10%. While the potential participant pool was large enough to provide enough participants to meet the *a priori* power analysis, a lower than expected number of participants resulted in the low *post-hoc* power. The study was not continued into 2020 due to the school's restrictions on in-person class gatherings during the 2020 fall semester. In addition to fewer than anticipated participants, the initial RIPLS scores in this study were high and minimal changes in score were seen, resulting in a very small effect size ( $d=0.06$ ). In spite of this, the study showed meaningful results regarding the secondary outcomes; specifically, students in the asynchronous group spent less time on the activity, but still perceived the objectives to be achieved well. Of note, the study was powered at 72% to detect a moderate change (of 10% or more) in the students' perception of their achievement of objectives ( $\alpha=0.05$ ).

Considering the current limitations of class gathering size imposed by COVID-19 precautions, the authors felt that these results were meaningful enough to share at this time. With an unpredictable return to normal classroom functions, it is important that programs are able to fulfill the IPE requirements of their respective accrediting bodies. Not only is this important for programs to remain in compliance with accreditation requirements, but it is important for the healthcare students to be exposed to IPE in preparation for their clinical coursework. The results



of this study demonstrate the viability and effectiveness of asynchronous, online IPE to provide the didactic preparation on three of the four IPEC domains.

### Conclusion

The comparison of a live and asynchronous IPE activity resulted in no significant differences in readiness for IPE between the two groups. Students in both delivery methods felt the activity met the predetermined objectives, which were designed to fit with the IPEC domains of IPE; those in the asynchronous group spent less time on the activity. Therefore, the asynchronous IPE activity provides a viable option to traditional live IPE activities to provide didactic learning experiences related to the PA and PT professions.

### References

Accreditation Review Commission on Education for the Physician Assistant, Inc. (2019).

Accreditation Standards for Physician Assistant Education, 4th edition. September.

<http://www.arc-pa.org/wp-content/uploads/2020/07/Standards-5th-Ed-Nov-2019.pdf>

Bartlett, J. L., & Kinsey, J. D. (2020). Large-group, asynchronous, interprofessional simulation:

Identifying roles and improving communication with student pharmacists and student nurses. *Currents in Pharmacy Teaching and Learning*, 12(6), 763–770.

<https://doi.org/10.1016/j.cptl.2020.01.023>

Brewer, M. L., Flavell, H. L., & Jordon, J. (2017). Interprofessional team-based placements: The

importance of space, place, and facilitation. *Journal of Interprofessional Care*, 31(4),

429–437. <https://doi.org/10.1080/13561820.2017.1308318>

- Chu, R. (2016). The Effect on Knowledge and Attitude of an Interprofessional Education Curriculum for Optometry and Physician Assistant Students. *Optometric Education*, 41(3).
- Collins, A., Broeseker, A., Cunningham, J., Cortes, C., Beall, J., Bigham, A., & Chang, J. (2017). A longitudinal online interprofessional education experience involving family nurse practitioner students and pharmacy students. *Journal of Interprofessional Care*, 31(2), 218–225. <https://doi.org/10.1080/13561820.2016.1255600>
- Commission on Accreditation in Physical Therapy Education. (2017). Standards and Required Elements for Accreditation of Physical Therapist Education Programs: Standard 6F. [http://www.capteonline.org/uploadedFiles/CAPTEorg/About\\_CAPTE/Resources/Accreditation\\_Handbook/CAPTE\\_PTStandardsEvidence.pdf](http://www.capteonline.org/uploadedFiles/CAPTEorg/About_CAPTE/Resources/Accreditation_Handbook/CAPTE_PTStandardsEvidence.pdf)
- Cook, D. A., Levinson, A. J., Garside, S., Dupras, D. M., Erwin, P. J., & Montori, V. M. (2008). Internet-Based Learning in the Health Professions. *Journal of the American Medical Association*, 300(10), 1181. <https://doi.org/10.1001/jama.300.10.1181>
- Eccott, L., Greig, A., Hall, W., Lee, M., Newton, C., & Wood, V. (2012). Evaluating students' perceptions of an interprofessional problem-based pilot learning project. *Journal of Allied Health*, 41(4), 185–189.
- Evans, S., Knight, T., Walker, A., & Sutherland-Smith, W. (2020). Facilitators' teaching and social presence in online asynchronous interprofessional education discussion. *Journal of Interprofessional Care*, 34(4), 435–443. <https://doi.org/10.1080/13561820.2019.1622517>
- Evans, S., Ward, C., Shaw, N., Walker, A., Knight, T., & Sutherland-Smith, W. (2020). Interprofessional education and practice guide No. 10: Developing, supporting and

- sustaining a team of facilitators in online interprofessional education. *Journal of Interprofessional Care*, 34(1), 4–10. <https://doi.org/10.1080/13561820.2019.1632817>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <https://doi.org/10.3758/BF03193146>
- Fowler, T., Phillips, S., Patel, S., Ruggiero, K., Ragucci, K., Kern, D., & Stuart, G. (2018). Virtual interprofessional learning. *Journal of Nursing Education*, 57(11), 668–674. <https://doi.org/10.3928/01484834-20181022-07>
- Giordano, C., Umland, E., & Lyons, K. J. (2012). Attitudes of faculty and students in medicine and the health professions toward interprofessional education. *Journal of Allied Health*, 41(1), 21–25. <http://www.ncbi.nlm.nih.gov/pubmed/22544404>
- Hertweck, M. L., Hawkins, S. R., Bednarek, M. L., Goreczny, A. J., Schreiber, J. L., & Sterrett, S. E. (2012). Attitudes toward interprofessional education: Comparing physician assistant and other health care professions students. *Journal of Physician Assistant Education*, 23(2), 8–15. <https://doi.org/10.1097/01367895-201223020-00003>
- Levy, L. A., & Mathieson, K. (2017). Attitudes of Physician Assistant Educators Toward Interprofessional Education and Collaborative Care. *The Journal of Physician Assistant Education*, 28(2), 72–79. <https://doi.org/10.1097/JPA.000000000000113>
- Lie, D. A., Fung, C. C., Trial, J., & Lohenry, K. (2013). A comparison of two scales for assessing health professional students' attitude toward interprofessional learning. *Medical Education Online*, 18(1), 21885. <https://doi.org/10.3402/meo.v18i0.21885>

- Mahler, C., Berger, S., & Reeves, S. (2015). The Readiness for Interprofessional Learning Scale (RIPLS): A problematic evaluative scale for the interprofessional field. *Journal of Interprofessional Care*, 29(4), 289–291. <https://doi.org/10.3109/13561820.2015.1059652>
- Manning, M. Lou, & Pogorzelska-Maziarz, M. (2017). Evaluation of an asynchronous online interprofessional clinical experience for DNP students. *Journal of Nursing Education*, 56(10), 618–622. <https://doi.org/10.3928/01484834-20170918-07>
- McCallister, E., Weidman-Evans, E. (2021). A pilot study using asynchronous case discussion and reflection to provide interprofessional education to physician assistant and physical therapy students. *Internet Journal of Allied Health Sciences and Practice*, 19(1), Article 12.
- McFadyen, A. K., Webster, V. S., & Maclaren, W. M. (2006). The test-retest reliability of a revised version of the Readiness for Interprofessional Learning Scale (RIPLS). *Journal of Interprofessional Care*, 20(6), 633–639. <https://doi.org/10.1080/13561820600991181>
- McFadyen, Angus K., Webster, V., Strachan, K., Figgins, E., Brown, H., & McKechnie, J. (2005). The Readiness for Interprofessional Learning Scale: A possible more stable subscale model for the original version of RIPLS. *Journal of Interprofessional Care*, 19(6), 595–603. <https://doi.org/10.1080/13561820500430157>
- Parsell, G., Spalding, R., & Bligh, J. (1998). Shared goals, shared learning: evaluation of a multiprofessional course for undergraduate students. *Medical Education*, 32(3), 304–311. <https://doi.org/10.1046/j.1365-2923.1998.00213.x>
- Reeves, S, Perrier, L., Goldman, J., Freeth, D., & Zwarenstein, M. (2013). Interprofessional education: effects on professional practice and healthcare outcomes (update). *Cochrane*

*Database of Systematic Reviews*, 3(3), CD002213.

<https://doi.org/10.1002/14651858.CD002213.pub3.www.cochranelibrary.com>

Reeves, Scott, Fletcher, S., McLoughlin, C., Yim, A., & Patel, K. D. (2017). Interprofessional online learning for primary healthcare: findings from a scoping review. *BMJ Open*, 7(8), e016872. <https://doi.org/10.1136/bmjopen-2017-016872>

Saini, B., Shah, S., Kearey, P., Bosnic-Anticevich, S., Grootjans, J., & Armour, C. (2011). An interprofessional learning module on asthma health promotion. *American Journal of Pharmaceutical Education*, 75(2), Article 30. <https://doi.org/10.5688/ajpe75230>

Sanborn, H. (2016). Developing asynchronous online interprofessional education. *Journal of Interprofessional Care*, 30(5), 668–670. <https://doi.org/10.1080/13561820.2016.1182143>

Schmitt, M., Blue, A., Aschenbrener, C. A., & Viggiano, T. R. (2011). Core competencies for interprofessional collaborative practice: reforming health care by transforming health professionals' education. *Academic Medicine*, 86(11), 1351. <https://doi.org/10.1097/ACM.0b013e3182308e39>

Schmitz, C., & Brandt, B. F. (2015). The Readiness for Interprofessional Learning Scale: To RIPLS or not to RIPLS? That is only part of the question. *Journal of Interprofessional Care*, 29(6), 525–526. <https://doi.org/10.3109/13561820.2015.1108719>

Segal-Gidan, F., Walsh, A., Lie, D., Fung, C. C., & Lohenry, K. (2014). Knowledge and attitude change in physician assistant students after an interprofessional geriatric care experience: a mixed methods study. *Journal of Physician Assistant Education*, 25(2), 25–30. <https://doi.org/10.1097/01367895-201425020-00006>

Smith, B. S., & Anderson, K. (2018). Attitudes Toward Interprofessional Education. *Journal of Physical Therapy Education*, 32(2), 183–190.

<https://doi.org/10.1097/JTE.0000000000000039>

Smith, L. J., Ascione, F. J., & Ruffolo, M. C. (2019). Large-Scale Asynchronous Online Interprofessional Learning Experience. *Journal of Allied Health*, 48(4), e123–e130.

<http://www.ncbi.nlm.nih.gov/pubmed/31800667>

Van Winkle, L. J., Bjork, B. C., Chandar, N., Cornell, S., Fjortoft, N., Green, J. M., La Salle, S., Lynch, S. M., Viselli, S. M., & Burdick, P. (2012). Interprofessional workshop to improve mutual understanding between pharmacy and medical students. *American Journal of Pharmaceutical Education*, 76(8), 150. <https://doi.org/10.5688/ajpe768150>

World Health Organization. (2010). Framework for action on interprofessional education & collaborative practice.

## Appendix A

## Comparison of RIPLS Scores by Delivery Type, Profession, and Cohort

	Change (mean [SD])	p-value
<b>TOTAL RIPLS SCORE</b>	<b>-0.11 (6.26)</b>	<b>0.88</b>
- Live Delivery	0.08 (5.97)	0.79
- Asynchronous Delivery	-0.32 (6.65)	
- PA Students	-1.84 (6.33)	0.04 <sup>a</sup>
- PT Students	1.25 (5.94)	
- 2018 Cohort	-1.70 (6.61)	0.07
- 2019 Cohort	1.00 (5.83)	
<b>TEAMWORK SUB-SCALE SCORE</b>	<b>-0.36 (3.53)</b>	<b>0.39</b>
- Live Delivery	-0.34 (3.71)	0.97
- Asynchronous Delivery	-0.37 (3.36)	
- PA Students	-1.25 (3.54)	0.06
- PT Students	0.34 (3.40)	
- 2018 Cohort	-1.1 (3.97)	0.13
- 2019 Cohort	0.17 (3.12)	
<b>PROFESSIONAL IDENTIFY SUB-SCALE SCORE</b>	<b>-0.05 (2.91)</b>	<b>0.87</b>
- Live Delivery	-0.03 (2.92)	0.93
- Asynchronous Delivery	-0.09 (2.94)	
- PA Students	-0.43 (2.90)	0.32
- PT Students	0.24 (2.92)	
- 2018 Cohort	-0.8 (3.02)	0.07
- 2019 Cohort	0.46 (2.76)	

	<b>Change (mean [SD])</b>	<b>p-value</b>
<b>ROLES/RESPONSIBILITIES SUB-SCALE SCORE</b>	<b>0.30 (1.59)</b>	<b>0.11</b>
- Live Delivery	0.45 (1.11)	0.41
- Asynchronous Delivery	0.14 (1.99)	
- PA Students	-0.16 (1.53)	0.03 <sup>a</sup>
- PT Students	0.66 (1.56)	
- 2018 Cohort	-0.27 (1.52)	0.10
- 2019 Cohort	0.37(1.65)	

*Note:* RIPLS, Readiness for Interprofessional Learning Survey

<sup>a</sup> Statistically significance with  $\alpha \leq 0.05$



**Appendix B**  
**The Readiness for Interprofessional Learning Survey**

		<b>Strongly Agree</b>	<b>Agree</b>	<b>Undecided</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<b>1.</b>	Learning with other students / professionals will make me a more effective member of a health and social care team.					
<b>2.</b>	Patients would ultimately benefit if health and social care students / professionals worked together.					
<b>3.</b>	Shared learning with other health and social care students / professionals will increase my ability to understand clinical problems.					
<b>4.</b>	Communications skills should be learned with other health and social care students / professionals.					
<b>5.</b>	Team-working skills are vital for all health and social care students / professionals to learn.					
<b>6.</b>	Shared learning will help me to understand my own professional limitations.					
<b>7.</b>	Learning between health and social care students before qualification and for professionals after qualification would improve working relationships after qualification / collaborative practice.					
<b>8.</b>	Shared learning will help me think positively about other health and social care professionals.					
<b>9.</b>	For small-group learning to work, students / professionals need to respect and trust each other.					
<b>10.</b>	I don't want to waste time learning with other health and social care students / professionals.					
<b>11.</b>	It is not necessary for undergraduate / postgraduate health and social care students / professionals to learn together.					
<b>12.</b>	Clinical problem solving can only be learnt effectively with students / professionals from my own school / organization.					
<b>13.</b>	Shared learning with other health and social care professionals will help me to communicate better with patients and other professionals.					

		<b>Strongly Agree</b>	<b>Agree</b>	<b>Undecided</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<b>14.</b>	I would welcome the opportunity to work on small group projects with other health and social care students / professionals.					
<b>15.</b>	I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health and social care students / professionals.					
<b>16.</b>	Shared learning and practice will help me clarify the nature of patients' or clients' problems.					
<b>17.</b>	Shared learning before and after qualification will help me become a better team worker.					
<b>18.</b>	I am not sure what my professional role will be / is.					
<b>19.</b>	I have to acquire much more knowledge and skill than other students / professionals in my own faculty / organization.					