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Erratum

Fixed layout error 6/8/18

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Increases in Graduate Students' Interprofessional Competence Associated with Clinical Training Activities

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Abstract

INTRODUCTION Interprofessional education is a critical and recommended element in most allied health training programs as it prepares emerging practitioners to work with professionals in other disciplines. The purpose of this study was to examine graduate students' interprofessional (IP) attitudes and perceived competence prior to and after they participated in a yearlong IP curriculum consisting of both educational and clinical activities. In addition, the study sought to determine if competence was related to the number or perceived value of the educational or clinical activities and if there was a correlation between attitudes and competence.

METHODS Participants were 45 graduate students in speech-language pathology (MS) and clinical psychology (PsyD) who completed self-report questionnaires at three time points during their first year of graduate school.

RESULTS Students participated in an average of 4.8 IP educational and 3.6 IP clinical training activities. Across the year, attitudes toward IP practice remained high. Students reported an increase in their IP competence, particularly associated with participation in clinical, rather than educational, activities. Attitudes and competence were only somewhat related, as students with better attitudes toward teamwork and shared roles reported an increase in competence.

DISCUSSION Students perceived that clinical training has a more positive impact on their knowledge and skills than didactic training; this pattern is consistent with practice guidelines that emphasize the importance of practical training.

CONCLUSION Future research should examine whether particular IP experiences are associated with increases in competence, and whether self-reported competence is associated with IP performance in practice.

Erratum: Fixed layout error 6/8/18

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Implications for Interprofessional Practice

- Clinical training in small IP teams may be more effective than lecture-based IP education.
- IP training programs may wish to standardize the number and type of clinical activities that students experience.
- Education about teamwork, roles and responsibilities may be particularly important early in training.

Introduction

Health care professionals are increasingly called upon to work collaboratively in order to provide more effective, cost-efficient, and patient-centered care (Interprofessional Education Collaborative Expert Panel [IECEP], 2011). Graduate training programs may play a key role in developing their students' interprofessional (IP) competence through a combination of educational and clinical activities. Through the presentation of interprofessional education, "when two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes" (World Health Organization [WHO], 2010, p. 13), students may develop skills necessary to engage in interprofessional collaborative care. Such care, defined as "Multiple health workers from different professional backgrounds provide[ing] comprehensive services...to deliver the highest quality of care across settings" (WHO, 2010, p. 13), is the current state of health care into which most of our graduates will enter. However, there is a widening gap between the training and actual practices for collaborative work in health care (IECEP, 2011). Without appropriate training, new clinicians may not be adequately prepared to move beyond their specific and individual scope of practice. To this end, the current study examined the effects of a year-long IP curriculum which exposed students to a variety of both educational and clinical activities, specifically evaluating IP attitudes and competence, as well as the extent to which the various training activities contributed to that competence.

Literature Review

Increasingly, professional organizations, including the American Psychological Association (2013) and American Speech-Language-Hearing Association (2015), recommend IP training models as best practice for graduate programs, in order for students to enter the workforce prepared to practice collaboratively. Graduate programs may incorporate a range of IP activities into their curricula, including formal educational activities such as courses, seminars, workshops or simulations; and supervised clinical experiences which may be delivered in an inpatient, outpatient, or community setting (see Institute of Medicine [IOM], 2013, 2015) for reviews). The IOM (2015) recently suggested that the impact of these activities can be assessed across five potential learning outcomes: reactions, attitudes/perceptions, knowledge/skills, collaborative behavior, and performance in practice. Although a number of measures and research projects have been developed to assess the effects of IPE (e.g., Canadian Interprofessional Health Collaborative, 2012; National Center for Interprofessional Practice and Education, 2017; Thannhauser, Russell-Mayhew & Scott, 2010), the majority of these focus on the first three areas described by the IOM, with fewer studies or instruments designed to examine changes in behavior or practice (see Canadian Interprofessional Health Collaborative, 2012; Hammick et al., 2007; and IOM, 2015 for reviews). Furthermore, research has typically examined only a single IP activity, rather than whether different IP activities contribute more or less to students' perceived IP competence. For example, Bridges et al. (2011) described the benefits of didactic, community-based, and simulation models

of IP education, but did not directly compare these three methods in relation to student knowledge or competence. Similarly, Aston et al. (2012) described the IPE programs at three academic health centers, each of which included multiple educational activities (e.g., courses, simulations); however these authors did not examine the separate impact of these different activities. An exception is one of Olson and Bialocerkowski's (2014) conclusions following a review of 17 studies examining university-based IPE, that students' perceptions were more positive when they worked in small and stable groups rather than large lectures. Although there is strong evidence that IPE works, as noted by Olson and Bialocerkowski, the "understanding of the relationship between different modes of IPE and outcomes is limited" (p. 242).

Even though the specific developmental progression of IP competence has not been clearly established, there is a logical connection and continuum across reaction, attitude, perception, knowledge, skill, and, ultimately, behavior change (IECEP, 2011). Educational approaches to enhance interprofessional competence vary from inadvertent exposure (e.g., students from two different disciplines separately treating the same client) to active, clinically integrated practice (e.g., working in a community based health setting with a variety of professions). Pedagogies involving active, situational-based learning should support the development of interprofessional competence, in particular if the graduate training program is purposeful in the engagement between education and practice (IECEP, 2011).

In the current study, the following hypotheses were examined among a sample of graduate students participating in a year-long IP curriculum that consisted of both educational (IPE) and clinical (IPC) activities: (a) students' attitudes toward IP practice will improve over the course of their first year in graduate school; (b) students' perceived IP competence will improve over the course of their first year in graduate school; (c) improvements in students' perceived IP competence will be related to the number, and perceived value, of the IPE and IPC in which they participated; and (d) attitudes will be correlated with changes in perceived competence.

Methods

Research Design

This study used a prospective longitudinal design in which self-report survey data were collected from participants at three time points over their first year of graduate training: during orientation at the start of their first year (August 2015; Time 1), after their second semester (May 2016; Time 2), and after their third (summer) semester (August 2016; Time 3). During this time period students participated in a year-long IP curriculum at a university training clinic consisting of both educational and clinical activities; see Tables 1 and 2 for descriptions of these, respectively. As noted in the tables, some IPE activities were mandatory and attended by all students, whereas other IPEs, and all IPCs, were experienced by only some students in some academic programs. Participation in these activities was typically driven by several factors, including the number of clients seeking particular services, training goals of the graduate programs, and availability and experience level of student clinicians.

Students participated in an average of 4.8 (SD = 1.3; range = 2-7) IP educational activities. As shown in Figure 1, the greatest proportion of students (98-100%) participated in the IP seminars that were mandatory for Psychology and Speech-Language Pathology (SLP) students and in discussion groups on general and disorder-specific (e.g., aphasia) topics (71.1%). Students participated in an average of 3.6 (SD = 1.5; range 2-9) IP clinical activities, also noted in Figure 1. The greatest proportion of students provided school-based group intervention focusing on language and literacy enrichment (82.2%), followed by internal consultation which required students to confer about a client with clinicians or supervisors outside of their specific field (73.3%). In sum, more than 50% of all students participated in six of the seven IP educational activities and three of the nine IP clinical activities.

Participants

Participants were 45 graduate students in their first year of a MS program in SLP (76%) or a PsyD program in clinical psychology (24%) who completed three waves of data collection. (Master's students in pastoral counseling and education/literacy participated in some IPE and IPC activities, and in the first two waves of data collection, but were not available at Time

Table 1. *Description of Interprofessional Educational (IPE) Activities*

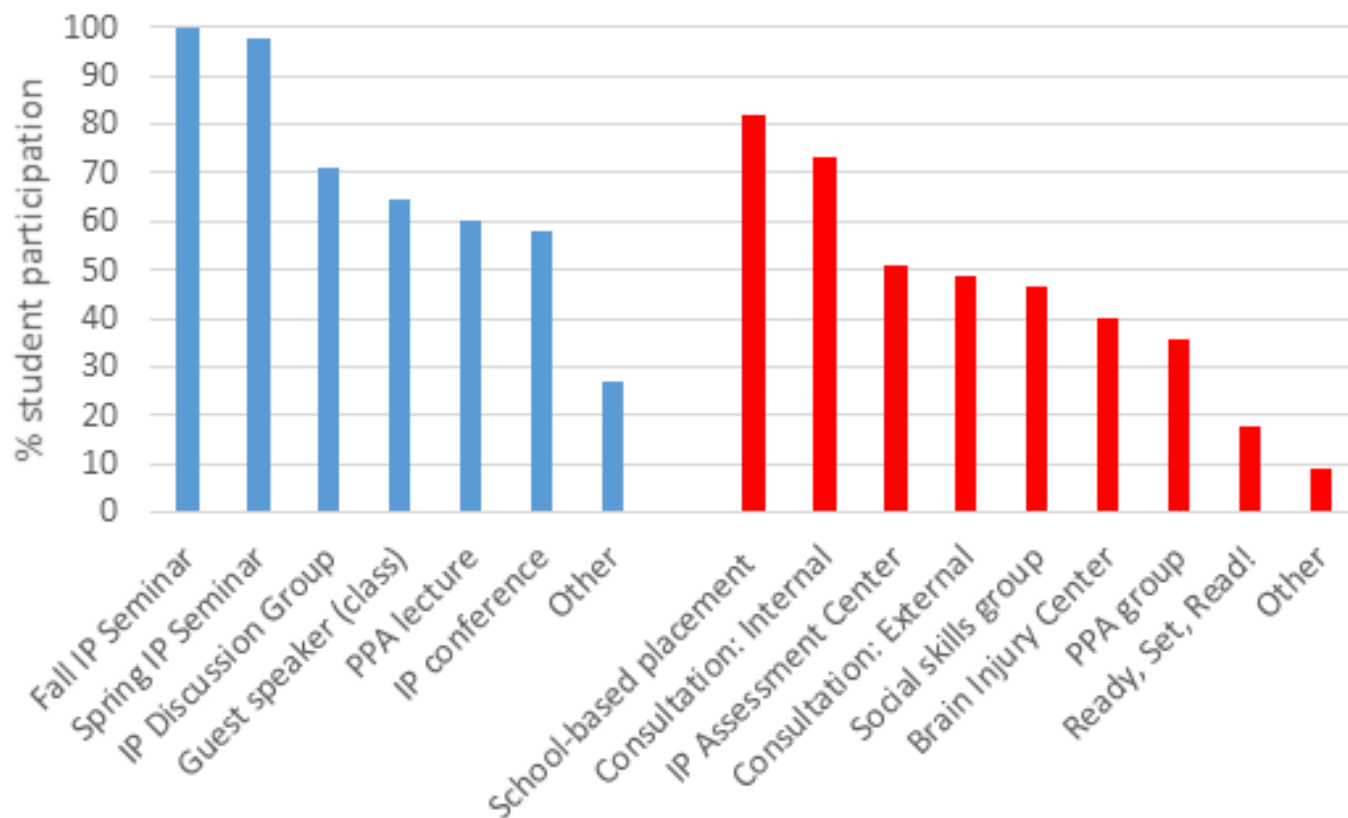
IPE Activity	Description
Fall IP Seminar: <i>Interprofessional Team Dynamics</i>	A single, 3 hour, mandatory event with the following objectives: (a) Identify and explain the four essential components of an interprofessional team; (b) Identify four challenges in developing an interprofessional team; (c) Self-reflection on individual responsibilities and development of your interprofessional competencies.
Spring IP Seminar: <i>Who We Are and What We Do</i>	A single, 3 hour, mandatory event with the following objectives: (a) Identify scope of practice for the four disciplines that make up the University training clinic; (b) Understand the academic and clinical sequence for all students enrolled in the four disciplines of the clinic; (c) Identify terminology from the four disciplines.
IP Discussion Group Series	A structured discussion group with a clinical faculty member from SLP or Psychology. Psychology students were required to attend one per semester, while SLP students were encouraged to attend. Topics included IEPs, 504 Plans, working with medical professionals, and case studies with structured discussion questions. Offered several times each semester.
Primary Progressive Aphasia (PPA) Presentation	Lecture given by a physician who specializes in PPA to clients with PPA, their caregivers, members of the community, and graduate clinicians in SLP and Pastoral Counseling (PC).
Guest speaker in class	Lecture given in a graduate course by a professional outside of the students' scope of practice (e.g., psychologist in SLP course; pharmacologist in Psychology course)
IP conference session	Attended a session at an external interprofessional conference.
Other	Students selected this option if they participated in an interprofessional educational activity not noted above; they did not describe the activities and so the authors could not confirm their content.

Note: Only IP seminar was mandatory for all students; other IPE activities were optional or required of only certain groups of students.

Table 2. *Description of Interprofessional Clinical (IPC) Activities*

IPC Activity	Description
Interprofessional Assessment Center	Provides specialized assessment typically for clients with difficulties with speech and language, hearing, attention and/or learning, through collaboration between three disciplines (psychology, speech-language pathology, and audiology). During an in-person feedback meeting with clients or parents, the team provides a single integrated report highlighting findings and recommendations.
Social Skills Group	Social skills training for youth ages 5-17 co-taught by students in Psychology and SLP. Group sessions of 6 to 8 children were 45 minutes in length over 10 weeks, using skill building activities and games, role-play, and direct skill instruction. Topics were customized to each group based on client needs identified through screening and intake process.
Ready, Set, Read!	For children ages 4-7, small group instruction (3-6 children) co-taught by graduate students in literacy and SLP. The focus was on the connection between language and literacy using multi-sensory methods. Met 3 times per week, for 90 minutes, for 3 weeks.
Brain Injury Center	Provides cognitive, communication, and psychosocial services to adults with acquired brain injury and disease (i.e., neurological disorders resulting from stroke, traumatic brain injury, progressive neurological disease). Assessment and treatment provided by an interprofessional team including Psychology, SLP, and audiology. Met at least weekly for at least 60 minutes, for 10-12 weeks.
School-Based RTI Language/Literacy	Graduate students in SLP lead literacy groups following a Response to Intervention (RTI) approach in the presence of and in consultation with classroom teachers. Services were provided for 10-12 weeks, 90 minutes a week.
Primary Progressive Aphasia (PPA) Resource & Discussion Group	Monthly, 60 minute group planned by SLP and PC students for 10-12 caregivers of clients with PPA. PC provided strategies to caregivers while SLP provided services to the clients and resources about PPA and communication. Spring semester only.
Consultation: Internal (within the clinic)	Student clinician consulted with graduate clinician and/or supervisor in a different discipline within the training clinic about a current client.
Consultation: External (outside of the clinic)	Student clinician consulted with a professional outside of the training clinic (e.g., primary care doctor, classroom teacher) about a current client.
Other IP Clinical activity	Students selected this option if they participated in an interprofessional clinical activity not noted above; the first author reviewed their description of the activity, if provided, to confirm the activity was IPC (for example, a parent support group).

NOTE: All services were provided by students under supervision by licensed faculty. Students were assigned to clinical services based on factors including the number of clients seeking each service, training goals of the graduate programs, and availability and experience of student clinicians.

Figure 1. Percent of student participation in IPE and IPC in rank order. Blue = IPE, Red = IPC

3 (T3); therefore their responses were not included in these analyses.) Participants were primarily female (91%) and Caucasian (73%), with an average age of 23.6 years (SD= 2.6; range 21 to 32).

Measures

Attitudes

Attitudes toward interprofessional collaborative practice were evaluated using the Interprofessional Attitudes Scale (IPAS; Norris et al., 2015), which consists of 27 items that form a total score as well as five subscales derived from factor analysis: (a) teamwork, roles, and responsibility (nine items; e.g., “Learning with other graduate students will help me become a more effective member of a team”), (b) patient centeredness (five items; e.g., “Establishing trust with my clients or students is important to me”), (c) interprofessional biases (three items; e.g., “I have prejudices or make assumptions about professionals from other disciplines”), (d) diversity and ethics (four items; e.g., “It is important for professionals to understand what it takes to effectively communicate across cultures”), and (e) community

centeredness (six items; e.g., “It is important for professionals to work on projects to promote community and public health care and education”). Each IPAS item is answered on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7). Three IPAS items are reverse coded so that higher scores indicate more favorable attitudes. With permission of the authors, wording of some IPAS items was changed in the current study to be more inclusive of graduate students in education, who participated in the initial phase of this study and do not identify as allied health professionals. Specifically, the term “health sciences students” was changed to “graduate students” and the term “patients” was changed to “clients/students.” The validity of the IPAS has been supported by exploratory and confirmatory factor analysis (Norris et al., 2015), and by improvements in IPAS scores following students’ participation in IPE (Blumenthal et al., 2015). In the current study, the IPAS was administered at both Time 1 (T1) and Time 2 (T2). Internal consistency reliability (Cronbach’s alpha) for four of the five IPAS subscales ranged from .62 to .85 at T1 and for the total scale was .72, which is similar to the reliability of .62 to .92 re-

ported by Norris et al. (2015). The exception was the Bias subscale that yielded an unacceptably low alpha of .43. This may have been due to the fact that the Bias subscale was the shortest, and two of the three items on this subscale were worded such that higher ratings indicated *less* favorable attitudes toward IP practice and thus had to be recoded, whereas most other IPAS items were worded such that higher ratings indicated more favorable attitudes. The Bias subscale was not analyzed because of this low alpha.

Competence

Competence in IP care was evaluated using the self-report Interprofessional Collaborative Competency Attainment Survey (ICCAS; Archibald, Trumpower, & McDonald, 2014), which consists of 20 items endorsed on a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7), with an additional option for “not applicable” (N/A). The ICCAS was designed to assess respondents’ perception of competence before and after education and/or training across six areas of IP competence: communication, collaboration, roles and responsibilities, client/family centered, conflict management/resolution, and team functioning. (Sample items include: “Work effectively with IP team members to enhance client care” and “Understand the abilities and contributions of IP team members.”) Following the design implemented by Trumpower et al., we used a retrospective pre-post design to assess students’ self-reported competence prior to and following their participation in the year-long IP curriculum. Specifically, at T3 students answered the 20 ICCAS items with the stem “Before participating in IP educational and clinical activities this year at the [training clinic] I was able to ...” and then answered the same 20 items with the stem “After participating ...”. Competence scores were created by taking the mean of the 20 items for “before” and “after” separately, such that higher scores indicated greater perceived competence. In the current sample, internal consistency reliability (Cronbach’s alpha) for the ICCAS items was .96 for the “before” ratings and .97 for the “after” ratings, which is similar to that reported among a sample of 584 undergraduate and graduate students and clinicians in 15 different programs (Trumpower et al.).

Contribution to IP competence

At T3 students were asked to rate, separately for each

IPE and IPC activity in which they had participated, “How much did this activity contribute to your overall interprofessional competence?” on a 5-point scale from 1 (did not contribute at all) to 5 (contributed a great deal), including an option for “did not attend.” Two average overall competence contribution ratings were obtained by calculating the mean of all students’ IPE and IPC ratings, respectively. Due to the variation in participation for each educational and clinical activity (see Figure 1), mean scores for individual activities were collected (see Figure 2) but only used as descriptive data and not included in correlational analyses.

Data Analysis

Data were analyzed using IBM SPSS version 23 to conduct paired-sample t-tests and correlations.

Ethical Considerations

This study was approved by the university’s Institutional Review Board. All data were collected anonymously; students were instructed to create their own confidential IDs so that responses from the three time points could be linked without revealing students’ identities.

Results

Attitudes

The first hypothesis, *students’ attitudes toward IP practice will improve over the course of their two semesters in graduate school*, was examined through pre- and post-testing using the IPAS. As shown in Table 3, students’ attitudes were generally very favorable toward IP practice at baseline, with means on the 7-point scale above 6.0 (“agree”) for all four subscales examined (i.e., Teamwork, Roles and Responsibility; Patient Centeredness; Diversity and Ethics; Community Centeredness) and the total IPAS scale, indicating a high level of agreement. Changes in students’ attitudes toward IP collaborative practice were examined by conducting paired-sample t-tests comparing their IPAS scores at T1 and T2; overall, despite slight changes in the means, there were no statistically significant changes in attitudes.

Perceived IP Competence and Contributions

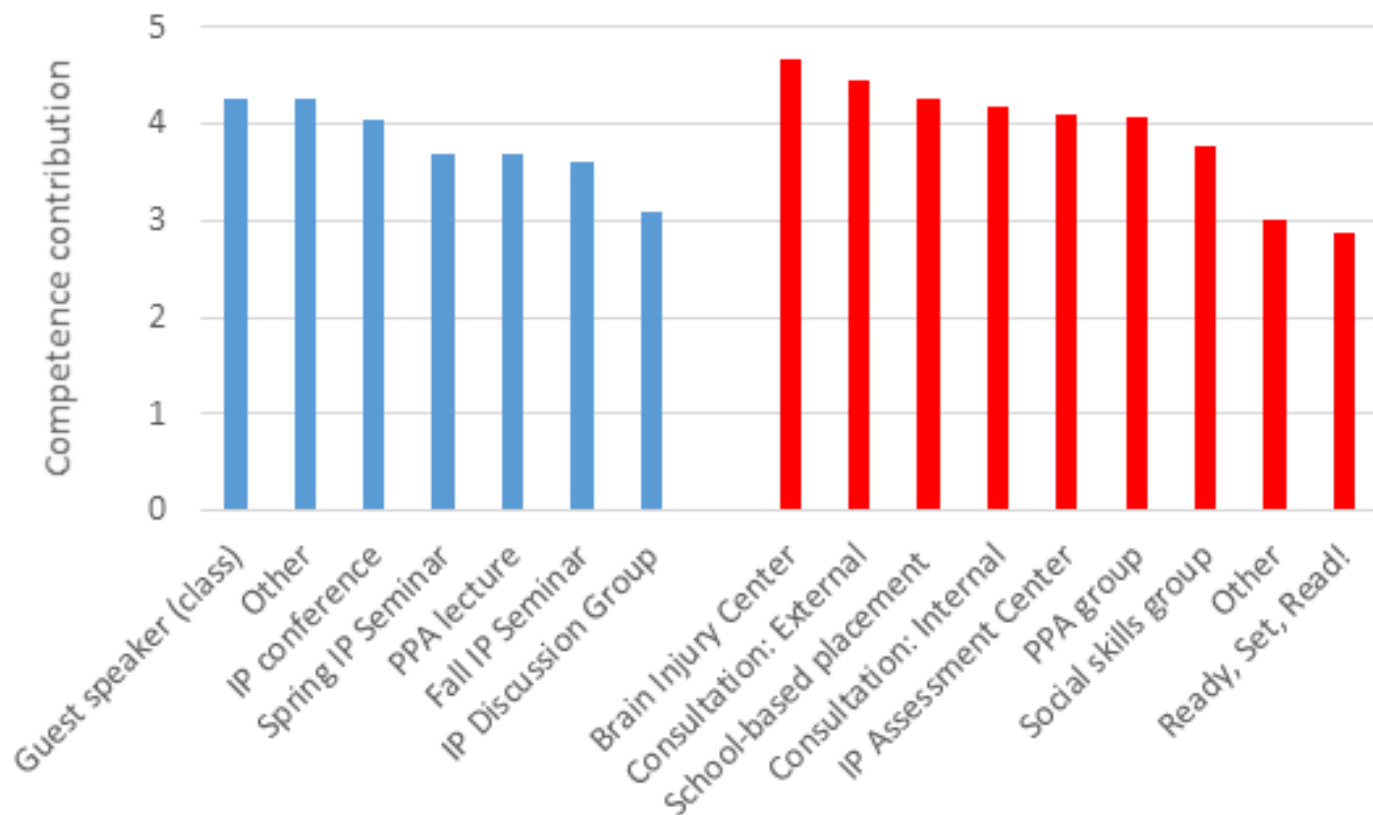
The second hypothesis, *students’ perceived IP competence will improve over the course of their first year in graduate school*, was examined by comparing students’

Table 3. Changes in Students' Attitudes toward IP Collaborative Practice, and Interprofessional Competence, from Time 1 to Time 2

IPAS Scale	T1 Mean (SD)	T2 Mean (SD)	t	P (one-tailed)
IPAS Total	6.3 (0.3)	6.3 (0.4)	0.75	.23
IPAS Subscales:	6.2 (0.5)	6.2 (0.6)	.59	.28
Teamwork/roles/responsibilities				
Patient Centeredness	6.8 (0.3)	6.8 (0.3)	0.00	.50
Diversity & Ethics	6.9 (0.2)	6.9 (0.2)	-1.02	.16
Community Centeredness	6.3 (0.7)	6.4 (0.6)	-.61	.27
ICCAS Competence	4.6 (1.2)	6.1 (0.7)	-9.07	<.001

Note: IPAS = Interprofessional Attitudes Scales. ICCAS = Interprofessional Collaborative Competency Attainment Survey

Figure 2. Mean competence contribution rating across IPEs and IPCs in rank order. Blue = IPE, Red = IPC



two ICCAS ratings: one rating competence before and the other rating competence after they completed the year-long IP curriculum. As hypothesized, following the year-long interprofessional curriculum, students reported on the ICCAS that their overall IP competence increased significantly from before to after the year of training (Table 3).

Figure 2 shows, for each IPE and IPC activity, the average ratings of how much that particular activity contributed to students' IP competence in rank order. Ratings for each activity were provided only by students who participated in that activity, so sample sizes for each rating vary. Each IPE activity was rated as contributing above the midpoint (3.0) on the competence contribution scale, indicating that each activity contributed at least somewhat. When ratings for all IPE activities were averaged together, the average competence-contribution rating was 3.8 (SD=.6). Similarly, each IPC activity but one was rated at or above the midpoint in terms of contributing to students' perceived IP competence, indicating that most IPC contributed at least somewhat (see Figure 2). When ratings for all IPC activities were averaged together, the average competence-contribution rating was 4.2 (SD=.6). A paired-samples t-test indicated that students perceived clinical activities as contributing more to their competence than educational activities ($t = -4.72$, $p_{\text{one-tailed}} < .001$).

To examine the third hypothesis, *improvements in students' perceived IP competence will be related to the number, and perceived value, of the IPE and IPC in which they participated*, a difference score was created by subtracting students' "before" ICCAS competence rating from their "after" rating. Results indicated that the perceived increase in competence was not correlated with *how many* IPE or IPC activities students participated in ($r = .10$, $p_{\text{one-tailed}} = .27$ and $r = -.09$, $p_{\text{one-tailed}} = .28$, respectively). Nor were increases in perceived competence related to the average competence-contribution rating for all *educational* activities (i.e., IPEs; $r = .23$, $p_{\text{one-tailed}} = .07$). However, perceived competence improved more when students rated all their *clinical* activities (i.e., IPCs) as contributing more to their competence ($r = .29$, $p_{\text{one-tailed}} = .03$); that is, the greater the average competence-contribution rating for all clinical activities, the greater the competence rating.

Correlations between Attitudes and Competence

The fourth hypothesis examined *associations between attitudes toward interprofessional practice as assessed with the IPAS, and perceived IP competence as assessed with the ICCAS*. Because attitudes did not increase significantly over the year (as described above), only T2 attitude ratings were examined, in relation to the change in perceived competence rating (ICCAS "before" scores subtracted from ICCAS "after" scores). As hypothesized, change in perceived competence (from pre- to post-training year) was positively correlated with post-test attitudes, but only specific to Teamwork Roles and Responsibilities (see Table 4), indicating that as competence improved, attitudes toward interprofessional teamwork became more favorable. However, change in competence was not associated with overall IPAS scores or other IPAS subscales.

Discussion

With a sample of 45 graduate students who participated in a year-long IP curriculum at a university clinic, this study sought to examine changes in attitudes toward, and perceived competence in, IP collaborative practices, and the extent to which various educational or clinical experiences were related to attitudes and competence. Overall, students in both psychology and speech-language pathology entered graduate school with highly favorable attitudes toward IP practice, perhaps reflecting students' exposure to IPE in undergraduate education or self-selection into these particular programs that offered IP training early in the program. Alternatively, these strong positive attitudes at the onset of the program may reflect what Archibald et al. (2014) describe as a lack of "knowing what they do not know" (p. 554); still this ceiling effect made it difficult to demonstrate the hypothesized improvements in attitudes. These findings are similar, but not identical, to both Blue and Zoller (2012) and Blumenthal et al. (2015), who found that students' attitudes were initially high and that, following IP education, students' attitudes toward IP practice improved on only one attitude subscale out of several that were assessed. In contrast, Hoffman and Harnish (2007) reported improvements in attitudes, using a 7-item measure, following a brief IPE activity for pre-health students. Overall, the present study's results revealed that students entered the graduate programs with a positive attitude about IP education and maintained that attitude throughout the program.

Table 4. Correlations between Changes in Students' Perceived IP Competence and Attitudes toward IP Practice at Time 2

IPAS Scale	r	P _{one-tailed}
IPAS Total	.19	.12
Teamwork, roles & responsibilities	.27	.05
Patient Centeredness	.15	.17
Diversity & Ethics	.10	.27
Community Centeredness	.10	.26

r = correlation between that IPAS scale and changes in students' perceived IP competence

As hypothesized, students reported that their IP competence improved significantly over the course of the one-year IP curriculum. The significant perceived change in IP competence is consistent with Archibald et al.'s (2014) findings, and may reflect an increased knowledge about the value and role of IP teams and the development of skills to move from working as an individual entity to a part of a team. That is, due to the complexities of interprofessional care of which early learners are not aware, they may view their role as separate and not interdependent with an IP team. However, learning about and experiencing interprofessional care may change this perception, leading to the recognition that interrelatedness is a positive and necessary component of good patient care.

Students participated in a range of IP educational and clinical activities over the course of the year, with participation rates varying according to whether the activity was mandatory, and the number of clients available to receive certain clinical services. Thus students in these two programs received varying and unmeasured "dosages" of the IP curriculum, making comparisons between individual activities difficult (as also noted by Reeves et al., 2009). However, overall ratings of educational and clinical IP activities indicated that students valued *clinical* IP activities more than *educational* ones. In addition, the increase in perceived competence was correlated to the clinical activities only, indicating that when examined as a whole, clinical training can have a positive impact on knowledge and perceived skills. These preliminary observations are consistent with the IPE panel's recommendation that clinical outcomes are more commonly associated with active, clinical learning, compared to less active exposure to concepts and other professionals (IECEP, 2011). They also support the findings of a recent review of IPE in allied health (Olson & Bialocerkowski, 2014), which found that ac-

tive intervention in small teams was more effective than lecture-based IP education. Some of the effectiveness of the curriculum examined in the present study may have been due to the extended amount of time most clinical activities required when compared to the educational ones, consistent with earlier research that activities needed to be a minimum of 2.5 hours (Olson & Bialocerkowski, 2014). Overall, the findings that IP clinical activities were perceived as more valuable and contributed greater to perceived competence reinforce the IECEP's (2011) posit that the clinical setting is crucial for the development of "practical learning, practice change, and patient-centered outcomes" (p. 27).

The study did not collect systematic data on the structure or outcomes of each IPE and IPC activity as students participated in them; therefore direct comparisons among activities cannot be made. However, there is speculation on factors that may have accounted for variations in students' perceptions of how much each activity contributed to their competence. For example, some IPE activities (such as IP seminars) were highly structured and led by faculty, and yielded a higher rating compared to other activities (such as IP discussion group) that were less structured, covered a wide range of topics, and were occasionally student-led. Similarly, among the IPC activities, student experience and familiarity may have played a role in their rating the early reading intervention as contributing less to their competence. Here, SLP students in their third semester of clinic were paired with literacy students in their first clinical placement for an intensive three week experience, leading to the possibility that the reduced knowledge about each other's roles and responsibilities affected the competence perception.

The graduate students' attitudes toward teamwork, roles, and responsibilities were uniquely related to their

perceived competence, suggesting that education in this area is particularly important early in training. The interprofessional seminar that all students attended during their first semester of this curriculum focused explicitly on roles, responsibilities, and scope of practice within the interprofessional team, as this competence appears foundational for effective teamwork. In addition, this foundational educational knowledge was coupled with interprofessional action, as the average student engaged in IP clinical training in two to three different settings over the year. This dual means of learning may be a critical contributing factor to the correlation between attitudes and perceived competence; that is, it is important to both learn about, as well as with, an IP team. Students may require additional education in this area as they move into settings where the interprofessional team represents a wider range of disciplines, requiring more diverse and possibly challenging roles and responsibilities.

Limitations of the current study include a relatively small convenience sample of students who completed all three waves of data collection, the lack of data on observed IP skills in practice, and reliance on self-report measures. In particular, students' retrospective competence ratings on the ICCAS may have been biased by their recent experiences, social desirability, or poor recall of their initial competence; however a benefit of this method, which was used by the authors of the measure (Archibald et al., 2014) is that students had the same perceived definition of each item. Furthermore, students were engaged in IPE and IPC simultaneously, thus it was difficult to measure separately the effects on their competence of these two types of experiences. Nor did we gather objective data on the duration or frequency of each IP activity. Finally, although pre-post designs such as this are the most commonly used in evaluating IPE (IOM, 2015), such studies are not as methodologically rigorous as designs involving a control group.

Concluding Comments

In conclusion, the results of the present study indicate that graduate students enter training programs with favorable attitudes toward interprofessional practice. Following a year-long IP curriculum consisting of educational and clinical activities, students perceive that their IP competence increased. They particularly credit clinical activities – including individually and group

administered interventions, assessment and diagnosis, consultation, and community-based services – as contributing to their competence. Future research should examine the effects of these IPE and IPC activities on observed practice and patient outcomes, at multiple points across the career, including when students begin external practice and as they enter independent practice (IOM, 2013, 2015).

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