

Comparison of Two Dental Hygiene Student Cohorts Receiving Varying Interprofessional and Intraprofessional Curricula

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Abstract

INTRODUCTION Most interprofessional education (IPE) research has measured student perceptions using pre/post-surveys during a single IPE activity or from a longitudinal assessment. It is important to begin to search for other educational attributes having an impact on student perception outcomes. This study reports IPE perceptions using the Student Perceptions of Interprofessional Clinical Education-Revised, version 2 (SPICE-R2) for two dental hygiene cohorts engaged in different IPE and intraprofessional experiences over a period of an academic year/two semesters.

METHODS First year dental hygiene students (DH I) and second year dental hygiene students (DH II) were asked to complete a survey including the SPICE-R2 instrument at the beginning and end of the 2017-18 academic year. The pre/post session paired analyses were performed using the Wilcoxon signed-rank test. The analysis comparing the DH I to DH II SPICE-R2 pre, post and overall factor mean scores was also done using the Wilcoxon signed-rank test. Cohen's d was used to calculate effect sizes.

RESULTS Fifty-seven paired data sets were analyzed, thirty-one students were in the first year and twenty-six were in the second year of the dental hygiene program. Results indicated a decrease in mean scores for the total SPICE-R2 and for both the Teamwork and Roles/Responsibilities factors for both DH I and DH II students. DH I students had a statistically significant decrease in the Teamwork and Roles/Responsibilities factors of the SPICE-R2.

CONCLUSION This study adds to the current literature by noting a statistically significant decrease in SPICE-R2 scores by early learners. Timing of the introduction of curriculum can be a contributing factor; however, it will be important for researchers to focus on components of curricula design to determine factors which impact student IPE learning, perceptions, and outcomes.

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Implications for Interprofessional Practice

- Interprofessional education research has largely focused on student perceptions and attitudes; however, there is a gap comparing curricular design.
- The findings from this study add to the literature by using a validated IPE assessment tool to measure two student cohort perceptions over a period of two semesters receiving different IPE and intraprofessional curricula trajectories.
- This study highlights the need for researchers to focus on other factors impacting student IPE learning such as: the introduction and implementation of curriculum; the variances among number and type of IPE engagement activities; and the implications of teamwork dynamics.

Introduction

The inclusion of interprofessional education (IPE) is a required accreditation standard for many health profession educational programs (Zorek & Raehl, 2013). Moreover, IPE is a necessary component in preparing students to become members of a collaborative health care workforce (World Health Organization [WHO], 2010). In order to increase the perceived validity of IPE efforts, there is a need to link student IPE learning to interprofessional collaborative behaviors. However, the academic community has yet to determine the most effective teaching pedagogy, timing, frequency and duration of IPE needed to prepare students for interprofessional collaboration.

Literature Review

The increase in IPE research over the past several years has primarily focused on student IPE perceptions and attitudes (Reeves et al., 2016). Most IPE research has measured student perceptions using pre/post-surveys during a single IPE activity. However, there is a need to assess perceptions at two or more points in a student's educational journey to measure progression or growth attributable to curricular design (Zorek et al., 2014) and to determine if attitudes are sustainable over time.

Common validated assessment instruments measuring longitudinal perceptions have included the Readiness for Interprofessional Learning Scale (RIPLS) (McFayden et al., 2005), the Interprofessional Education Perception Scale (IEPS) (McFayden, Maclaren, & Webster, 2007), the University of West England (UWE) questionnaire (Pollard, Miers, & Gilchrist, 2004), and the Student Perceptions of Interprofessional Clinical

Education-Revised, version 2 (SPICE-R2) (Zorek, Lockeman, Gunaldo, & Eickhoff, 2007). There are several articles reporting positive and negative changes in student IPE perceptions over a period of time (Coster et al., 2008; Hudson, Lethbridge, Vella, & Caputi, 2016; McFayden, Webster, Maclaren, & O'Neill, 2010; de Oliveira et al., 2018; Wong et al., 2016; Thompson, Bratzler, Fisher, & Torres, 2016; Lockeman et al., 2017). However, only two investigated a non-demographic variable in relation to perceptions (de Oliveira et al., 2018; Wong et al., 2016). There is a research gap investigating other influential factors on IPE perceptions beyond a longitudinal assessment.

De Oliveira et al. measured different student cohorts from a Brazilian university engaging in their first health course and their ninth health course (2018). Although the health courses did not include formal IPE, they provided opportunities to meet students from different health professions (de Oliveira et al., 2018). The authors used the RIPLS for assessment and reported a statistically significant decrease in the total RIPLS score for all combined students which represented six professions (de Oliveira et al., 2018). This study also measured student contact with other health professions during formal educational opportunities, informal educational opportunities and social engagements (de Oliveira et al., 2018). The results from the study found no correlation between number of contacts and RIPLS scores (de Oliveira et al., 2018). Wong et al. indicated a statistically significant decrease in the roles and responsibilities RIPLS category score over a three year time period (2016). Students from three professional programs completed a pre-survey in their first year of study and a post-survey in their third year of study

(Wong et al., 2016). Similar to de Oliveira, this study categorized different engagement opportunities, such as interprofessional courses, interprofessional extracurricular activities, student pro-bono clinics and relationships developed outside of the educational environment (Wong et al., 2016). The results of the study indicate a positive statistically significant difference in the teamwork and collaboration RIPLS subscale with student engagement in interprofessional extracurricular activities as compared to not engaging in these activities (Wong et al., 2016). This finding suggests that extracurricular activities, more specifically involving the community, can have a positive impact on perceptions as measured over time (Wong et al., 2016).

With variances in student perception outcomes as measured longitudinally, it is important to begin to search for other educational attributes having an impact on student perception outcomes. This study reports the IPE perceptions using the SPICE-R2 for two dental hygiene cohorts engaged in different IPE and intraprofessional experiences over a period of an academic year/two semesters. Intraprofessional education involves students from different disciplines within the same profession, such as dental hygiene and dental, learning from, about, and with each other (Hamil, 2018; Jones, Karydis, & Hottel, 2017). It is important to include the students' intraprofessional experiences in addition to their interprofessional experiences because both assist in preparing students to be collaborative-practice ready (Hamil, 2018; Jones et al., 2017; Formicola et al., 2012; Brame, Mitchell, Wilder, & Sams, 2015; Meijer, de Groot, Blaauw-Westerlaken, & Damoiseaux, 2016; Jelley, Larocque, & Borghese, 2016). First year dental hygiene students (DH I) in the study were exposed to seven IPE experiences embedded within a two year longitudinal IPE curriculum in addition to two individual intraprofessional educational experiences. Second year dental hygiene students (DH II) were exposed to three IPE experiences integrated within varying courses and four individual intraprofessional educational experiences. In a systematic review, Reeves et al. focused on high quality IPE literature and supported increasing rigor in future IPE studies (2016). In an attempt to create a more robust study of outcomes, this study compared perceptions of two student cohorts over time receiving two different curricular approaches to IPE.

The purpose of this research study was to measure and compare IPE perceptions of first and second year dental hygiene student cohorts over a period of an academic year/two semesters using the SPICE-R2. The research question, 'do varying IPE and intraprofessional curricula impact student IPE perceptions over the period of an academic year' was measured using the SPICE-R2.

Methods

DH I and DH II students at Louisiana State University Health-New Orleans (LSUH-NO) School of Dentistry were asked to complete a survey including the SPICE-R2 instrument at the beginning and end of the 2017-18 academic year. DH I students enrolled in the two year longitudinal IPE curriculum were required to complete the pre-SPICE-R2 survey prior to the first class session in September 2017. The post-SPICE-R2 survey was completed within one week after the last session in April 2018. The DH I students received a link to the SPICE-R2 survey in an online assignment for both the fall and spring semesters. Unlike the DH I students, the DH II students were not required to complete the SPICE-R2 survey, but were given the SPICE-R2 to complete two weeks following the start of the Fall 2017 semester (August 2017) and subsequently at the conclusion of the Spring 2018 semester (April 2018). The DH II students were provided a link to the SPICE-R2 survey via email by a dental hygiene faculty member both in the fall and spring semesters. The research portion was approved by the Institutional Review Board at LSUH-NO.

Assessment Tool

The SPICE-R2 instrument was selected to evaluate students' perceptions related to IPE. Originally published in 2013 as the Student Perceptions of Physician-Pharmacist Interprofessional Clinical Education (SPICE) instrument (Fike et al., 2013), it was subsequently revised and validated for use in all health professions as SPICE-R2 (Table 1) (Zorek et al., 2017). The SPICE-R2 instrument is composed of ten items capturing student perceptions about IPE using three factors: (1) Interprofessional Teamwork and Team-Based Practice (four items), (2) Roles/Responsibilities for Collaborative Practice (three items), and (3) Patient Outcomes from Collaborative Practice (three items) (Lockeman et al., 2017). Students rate each of the ten statements using a 5-point Likert-type scale ranging from 1=strongly disagree to 5=strongly agree. Previously established reliability

for internal consistency was 0.83 overall, 0.74 for the Teamwork factor, 0.72 for the Roles/Responsibilities factor and 0.83 for the Patient Outcomes factor (Zorek et al., 2017). The SPICE-R2 instrument was chosen

for this study because of its convenience, demonstrated reliability, and ability to assess IPE perceptions from a pre/post perspective (Zorek et al., 2017).

Question	Factor
1. Working with students from different disciplines enhances my education.	Teamwork
2. My role within an interprofessional team is clearly defined.	Roles/Responsibilities
3. Patient/client satisfaction is improved when care is delivered by an interprofessional team.	Patient Outcomes
4. Participating in educational experiences with students from different disciplines enhances my ability to work on an interprofessional team.	Teamwork
5. I have an understanding of the courses taken by, and training requirements of, other health professionals.	Roles/Responsibilities
6. Healthcare costs are reduced when patients/clients are treated by an interprofessional team.	Patient Outcomes
7. Health professional students from different disciplines should be educated to establish collaborative relationships with one another.	Teamwork
8. I understand the roles of other health professionals within an interprofessional team.	Roles/Responsibilities
9. Patient/client-centeredness increases when care is delivered by an interprofessional team.	Patient Outcomes
10. During their education, health professional students should be involved in teamwork with students from different disciplines in order to understand their respective roles.	Teamwork

Table 1. *SPICE-R2 Questions and Respective Factors*

Participants

The LSUH-NO Program in Dental Hygiene (DH) is a two-year program accepting 38 students per class. At the time of the study, 32 students were attending classes on the New Orleans campus and 6 students were attending classes on the Lafayette campus. There were two DH cohorts included in the study: DH I and DH II. All students within the DH II class were female and all but one student within the DH I class were female. DH I students were in their first year of study and DH II students were in their second year of study. The Lafayette campus students did not have the same IPE experience(s) as the New Orleans-based students; therefore, the Lafayette campus students were not included in the research study. It is important to note that at the time of the study, the dental hygiene program was the only program within the institution with student cohorts exposed to two completely different IPE and intraprofessional experiences.

History of Experiences

The Commission on Dental Accreditation (CODA)

Standard 2-15 for dental hygiene programs states: “graduates must be competent in communicating and collaborating with other members of the health care team to support comprehensive care” (American Dental Association [ADA], 2018). Although, IPE is not specifically mentioned as a required accreditation standard in dental hygiene education, IPE supports Standard 2-15. The DH program at LSUH-NO School of Dentistry values collaborative practice, and has placed an emphasis on developing and implementing IPE experiences throughout the two-year curriculum. In the 2017-18 academic year, LSUH-NO implemented a large-scale IPE curriculum mandatory for all first and second year students. Team Up: Commit to Compassion, Communication and Collaboration™ is a two-year longitudinal IPE experience integrated within the curriculum of all LSUH-NO Schools (“Team Up™ Overview”, 2018). In September 2017, the inaugural student cohort included first year students across nineteen programs, including dental hygiene (“Team Up™ Overview”, 2018). The focus of the first year in Team UP™ was for students to build communication

and teamwork skills through small group discussion and case scenarios (“Team Up™ Overview”, 2018). Team Up™ included sixty-five student teams which met for seven, two-hour monthly small-group sessions throughout the fall and spring semesters. Each team included approximately 12 students representing 6-8 different academic programs. Programs included were audiology, cardiovascular sonography, clinical laboratory sciences, clinical rehabilitation counseling, dental, dental hygiene, medicine, occupational therapy, physical therapy, physician assistant, public health, nursing (traditional undergraduate and accelerated bachelor program), respiratory therapy and speech-language pathology. In addition to the classroom-based monthly sessions, students engaged in a culminating Health Partner project. Student groups were paired with a community member (Health Partner) to learn about his/her health, health goals, and healthcare experiences (“Team Up™ Health Partner Program”, 2018). In addition to Team Up™, the DH I students were exposed to two clinical intraprofessional experiences in the spring semester: 1) paired with third year dental students in Oral Diagnosis Clinic where DH I students participated in collecting information needed for patients’ initial assessments and observing the dental students present patient treatment plans. Following this experience, both dental and DH I students were asked to participate in a brief survey giving the opportunity to reflect on roles and responsibilities, and 2) participated in patient mini-clinics, which is a student oral health team consisting of a DH I student, a DH II student, a second year dental student, a third year dental student, and a fourth year dental student. These student teams provide oral health care to approximately 65 patients each and meet approximately every six weeks to discuss patient care. These experiences focused on: clarifying students’ roles and responsibilities, improving communication with patients and health team members, promoting active listening while encouraging ideas and opinions of other team members, and engaging other health professionals in shared, patient-centered problem-solving.

During the same academic year, the DH II students did not participate in Team Up™; however, they did experience both single IPE and intraprofessional opportunities. These opportunities included: 1) providing primary care services in a school setting with undergraduate nursing students, 2) providing den-

tal hygiene services in a hospital setting with other healthcare providers, 3) providing dental hygiene services in an outpatient primary care clinic with dental students and post-graduate dental residents, 4) assisting in clinical care with dental students and providing peer feedback for dental students, 5) attending a single IPE lecture and interactive session covering the topic of vaccinations, 6) participating in patient mini-clinics with DH I students and dental students and, 7) collaborating with first through fourth year dental students to develop a presentation on a clinical case. These IPE and intraprofessional experiences focused on: clarifying students’ roles and responsibilities, improving communication with patients and health team members, promoting active listening while encouraging ideas and opinions of other team members, engaging other health professionals in shared, patient-centered problem-solving, and giving constructive feedback to members of the health team.

Data analysis

A retrospective study was conducted of SPICE-R2 assessment data from DH I and DH II students during the 2017-2018 academic year. Quantitative analyses were conducted using SAS (version 9.4). The pre/post session paired analyses were performed using the Wilcoxon signed-rank test. The analysis comparing the DH I to DH II SPICE-R2 pre, post and overall factor mean scores was also done using the Wilcoxon signed-rank test. Cohen’s *d* was used to calculate effect sizes. All tests were two-tailed using an alpha level of 0.05. Overall reliability was measured using Cronbach’s alpha for the overall SPICE-R2 instrument and the three subscales (Acceptable: 0.70 - 0.80, Good: > 0.80).

Results

Sixty-one dental hygiene students completed the pre-survey and sixty-two students completed the post-survey. Responses from students that did not complete both surveys were excluded. Two DH II students did not complete question 6 on both the pre- or post-session survey; therefore, these surveys were excluded as well. Fifty-seven paired data sets were analyzed, thirty-one students were in the first year and twenty-six were in the second year of the dental hygiene program. The mean scores for the students overall and by program year are shown in Table 2.

Survey	Academic Year	SPICE-R-2 Mean (SD)	Teamwork Factor Mean (SD)	Roles Factor Mean (SD)	Patient Outcomes Factor Mean (SD)
Pre	DH I	41.87 (3.04)	17.65 (1.72)	11.84 (1.24)	12.39 (1.23)
Pre	DH II	44.38 (3.81)	19.00(1.52)	12.46 (1.53)	12.92 (1.79)
Pre	All Students	43.02 (3.61)	18.26 (1.76)	12.12 (1.40)	12.63 (1.52)
Post	DH I	39.71 (6.09)	16.23 (2.64)	10.78 (2.31)	12.23 (2.04)
Post	DH II	43.23 (7.89)	18.08 (3.32)	11.81 (2.64)	12.92 (2.65)
Post	All Students	41.32 (7.13)	17.07 (3.09)	11.25 (2.49)	12.54 (2.35)
Post-Pre	DH I	-2.16 (6.27)	-1.42 (3.17)*	-1.06 (2.24)*	-0.16 (1.90)
Post-Pre	DH II	-1.15 (8.24)	-0.92 (3.64)	-0.65 (2.83)	0.00 (2.56)
Post-Pre	All Students	-1.70 (7.19)	-1.19 (3.37)*	-0.88 (2.51)*	-0.09 (2.21)

Table 2. SPICE-R2 means and standard deviation for DH students by program year

*Denotes statistical significance ($p < 0.05$)

Next, the change in mean scores for each of the SPICE-R2 factors for all students and by program year was evaluated (Table 2). Statistical significance in post-pre mean scores for all students ($p=0.0076$) and DH I students ($p=0.0144$) was found for the Teamwork factor and the Roles/Responsibilities factor (all: $p=0.0325$; DHI: $p=0.0281$). No statistical significance for post-pre mean changes was found for the SPICE-R2 overall, the DH I Collaborative Practice factor, and all three factors for DH II students. An analysis of effect size for the overall scores and by student year showed moderate Cohen's d values for the differences in DH I Teamwork and Roles/Responsibilities means (0.63 and 0.67, respectively). Effect size values for the remaining overall and factor score differences were less than 0.50, which are generally considered to be small. Reliability of the overall SPICE-R2 instrument for this study was 0.86 and reliability for the individual subscales was also good (Interprofessional Teamwork and Team-based Practice 0.90, Roles/Responsibilities for Collaborative Practice 0.95 and Patient Outcomes from Collaborative Practice 0.93).

The analysis comparing the pre- mean scores (Table 2) between DH I and DH II students found a statistically significant difference in the Teamwork factor ($x^2=8.72$, $p=0.0031$) and the Roles/Responsibilities factor means ($x^2=4.66$, $p=0.0309$). The evaluation of the post-session response means showed a statistically

significant difference between DH I and DH II for the Teamwork factor ($x^2=10.62$, $p=0.0011$). Statistically significant differences were also noted in the overall SPICE-R2 for both the pre- ($x^2=8.53$, $p=0.0035$) and the post-survey ($x^2=8.04$, $p=0.0046$) means. The comparative analysis between the remaining DH I and DH II pre-survey, post-survey, and post-pre survey means were not statistically significant for individual factor or total SPICE-R2 scores.

Discussion

Interprofessional collaboration is recognized as one of the most promising solutions to transforming health care (WHO, 2010). It is the role of educators to determine best practices for IPE in academic programs in order to prepare students to work collaboratively. Although the IPE literature measuring perceptions has continued to grow, many gaps still remain. This study adds to the research by investigating perception outcomes comparing two student cohorts in different years of study experiencing varying curriculum trajectories.

Over the period of an academic year, DH I student scores for the Teamwork and Roles/Responsibilities factors had a statistically significant decrease (Table 2). Similar to the SPICE-R2, the RIPLS includes a Teamwork and Roles/Responsibilities subscale. Results from this study noted a decrease in the SPICE-R2 Teamwork factor, similar to other longitudinal studies

that used the RIPLS to measure student perceptions (Hudson et al., 2016; McFayden et al., 2010). However, this study is the only research noting a decrease in the Roles/Responsibilities factor.

Considering the individual SPICE-R2 Roles/Responsibilities factor questions (Table 1), the 2017 Team Up™ curriculum did not provide adequate learning opportunities to exchange information about educational training (SPICE-R2 Question 5) for the multiple professions included in each student group. Adjustments in the learning activities are needed for future learner cohorts. In addition, the focus of the first year Team Up™ curriculum is not on defining professional roles (SPICE-R2 Question 8), as first year learners are simultaneously learning about their roles in their respective programs. Learning more about professional roles is a focus in the second year of Team Up™. A continuation of measuring student perceptions after their second year in Team Up™ can provide clarity in student perceptions of learning about other professional roles.

A decline in SPICE-R2 mean scores is not a desired student IPE learning outcome. However, other reasons for decline can be attributed to the Dunning-Krueger effect (Kruger & Dunning, 1999) and the use of a real time pre/post-test design. In order to reduce a response-shift bias, a retrospective pre/post-test design is suggested to determine effectiveness of trainings instead of a real time pre/post-test time sequence (Sprangers, 1989). Lockeman et al. utilized a retrospective pre/post-test design and demonstrated a positive change in student IPE perceptions (2017). At the time of the research study, the SPICE-R2 was not published using a retrospective design. Therefore, a pre/post-test sequence was utilized. Future research is recommended comparing real time measurements to retrospective measurements in order to determine which method promotes accuracy in student outcomes.

The Team Up™ IPE classroom experiences for DH I students were primarily focused on building foundational teamwork skills within the same interprofessional teams, while the DH II students mostly engaged in clinical skills application and discussing interprofessional collaborative opportunities with different student teams in various settings. The majority of DH I student IPE engagement was in the classroom setting. The educational setting could have an impact on the statistically significant decrease in post-pre SPICE-R2

Teamwork and Roles/Responsibilities factor scores. Students may not find significance in learning and applying teamwork skills conducted in a classroom setting as compared to a realistic clinical setting. As early learners, DH I students may not have been able to see the relevance of teamwork and the roles of other professions without clinical exposure. To further this point, DH I students engaged in a total of seven IPE experiences, mostly classroom based, compared to DH II students who engaged in three IPE experiences, primarily clinic based. Thompson et al. noted a positive change in the total RIPLS score of students engaged in both classroom and clinical IPE experiences (2016).

There were no statistically significant findings noted for DH II students for post-pre differences. Educators should consider if several single IPE activities within an academic year is sufficient to have a long-lasting impact on student IPE perceptions. DH II students did have a statistically significant higher SPICE-R2 pre-mean scores as compared to DH I students for the total score as well as the Teamwork and Roles/Responsibilities SPICE-R2 factors. DH II students were exposed to a single IPE experience in January 2017 prior to the academic year of measurement for this study. Prior IPE exposure or being a student in the second year of an academic program may have had an impact on the higher pre-mean SPICE-R2 scores for DH II as compared to DH I students. Additionally, the DH II students being more comfortable in their professional role as compared to DH I students may have contributed to these higher pre-mean scores.

The research does include limitations, such as a single site, no control group for comparison and small sample size. Although a control group would be beneficial, at the time of this study including a control group from LSUH-NO was not possible. Given the low to moderate effect size values obtained, larger samples sizes would have increased the study's power. With academic accreditation standards requiring IPE, LSUH-NO has committed to a two-year longitudinal experience for all first and second year students. Therefore, all DH I students were required to participate in Team Up™. In addition, all DH II students were required to participate in IPE educational experiences. It is also important to mention why the authors chose to only include dental hygiene students in the study. At the time of the study, the dental hygiene program was the only program within the institution with student co-

horts exposed to two completely different IPE experiences. Another limitation is the longitudinal use of the SPICE-R2 tool versus traditional assessment of single, short-term, IPE experiences. As the IPE literature continues to grow, appropriate use of validated assessment tools should be further assessed.

The findings from the study add to the literature by using a validated IPE assessment tool to measure two student cohort perceptions over a period of two semesters receiving different IPE and intraprofessional curricula trajectories. This study also highlights the need to compare curricular designs to determine the impact on student learning as it relates to IPE. With positive, negative, and neutral outcomes being reported from longitudinal studies, it will be important for educators to continue their research in student outcomes and perceptions to determine other curricular factors which impact student IPE outcomes.

Conclusion

This study adds to the current literature by noting a statistically significant decrease in SPICE-R2 scores by early learners. Factors contributing to this decrease can include: the timing of the introduction of curriculum, the utilization of real time vs. retrospective measurements, the number and type of activities (single vs. connected), and the nature of the teams (static vs. dynamic). It will be important for educators to continue research in IPE perceptions to determine factors which impact student IPE learning.

The IPE literature continues to grow within the health professions. Progression of validated assessment tools, varied interprofessional learning experiences, as well as longitudinal research designs are all contributing factors. Those in academia are waiting for clear evidence to emerge on the effectiveness of IPE regarding behavioral competence. However, researchers also need to focus on what foundational curricular components can better prepare students for interprofessional practice.

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