

# Innovative Collaborative Service-Learning Experience among Dental Hygiene and Nurse Practitioner Students: A pediatric oral health pilot study

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## Abstract

**Purpose:** Preventive oral health behaviors are essential for children during early stages of development. The purpose of this study was to pilot an innovative, collaborative service-learning (ICSL) experience for dental hygiene (DH) and primary care nurse practitioner (NP) students to address pediatric oral health.

**Methods:** A convenience sample of DH and NP students (n=12) participated in the development, planning and delivery of an ICSL activity focusing on pediatric oral health to 44 pre-school aged children. A learning management system was used for the communicating, planning and evaluating the ICSL activity. The interprofessional socialization of the participants was measured using the Interprofessional Socialization and Valuing Scale (ISVS-9A/9B) survey prior to and following the ICSL experience. Descriptive statistics were used to analyze the data.

**Results:** Twelve students agreed to participate in the ICSL experience (DH= 9 and NP=3) and completed the pre and post ISVS-9A/9B surveys. There was a positive change in interprofessional socialization scales (0.42) after the ICSL experience ( $p=0.066$ ) for all participants. Marginal statistically significant differences were identified among the DH participants ( $p=0.058$ ) in their pre and post interprofessional socialization scores.

**Conclusion:** Within the limitations of this pilot study, the ICSL experience had a positive impact on NP and DH students' socialization to interprofessional collaboration. This low resource, service-learning educational project has potential for easy integration within dental hygiene and advanced practice nursing curricula.

**Keywords:** pediatric oral health, dental hygienists, nurse practitioners, interprofessional education, service learning

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## Introduction

Dental caries is a chronic preventable disease that remains a public health problem among children and adolescents. Dental caries results when the enamel becomes compromised by bacteria plaque and the resulting acids produced from the breakdown of dietary carbohydrates.<sup>1</sup> Preventive oral health behaviors are important throughout the lifespan; however, they are even more essential for children during early stages of development. Data from the 2015-2016 National Health and Nutrition Examination Survey (NHANES) revealed 21.4% of children aged 2-5 years in the United States (U.S.) had experienced dental caries and 8.8% of children had untreated dental caries.<sup>2</sup>

The American Academy of Pediatric Dentistry (AAPD), advocates for children to establish a dental home by 12 months of age as a strategy for reducing dental caries risk among children.<sup>3</sup> In 2016, 63.9% of children aged 2-4 years had a dental visit in the past year.<sup>4</sup> A dental home represents a collaborative approach between the patient, caregiver, dental and non-dental professionals focusing on all aspects of oral health.<sup>3</sup> Pediatric primary care providers have a unique opportunity to promote preventive oral health through education, oral screenings, fluoride varnish application and referrals to dental providers. In most cases, these providers have initial and subsequent regular encounters with the

child and caregiver during the first 12 months of life (7 visits between 0-12 months based on the schedule recommended by the American Academy of Pediatrics) often prior to the first dental visit.<sup>5</sup>

In a pilot study conducted by Claiborne and Poston,<sup>6</sup> researchers found that nurse practitioner students' pediatric oral health knowledge and comfort level related to oral health practices improved after receiving online educational content and a 60-minute simulated hands-on fluoride varnish application training. Moreover, the student participants valued the need to incorporate oral health into their well-child assessments.<sup>6</sup> Nurses', dental hygienists', and dental hygiene students' pediatric oral health knowledge and practice behaviors have been studied to ascertain gaps in education and practice experiences.<sup>6-12</sup> Researchers have identified continuing education, service learning activities, didactic and clinical experiences as strategies for improving pediatric oral health education and clinical experiences among providers and health professional students.

Providing collaborative interprofessional learning opportunities for health professional students, with a focus on pediatric oral health, has been the goal of previous research studies.<sup>13-15</sup> Isibel et al. designed a faculty facilitated, student-led (dental hygiene, nursing, public health and environmental health) interprofessional service-learning activity to develop maternal and child oral health educational materials for paraprofessionals.<sup>13</sup> However, no studies have been identified in the literature that focus on an interprofessional collaborative approach between dental hygiene and advanced practice nursing students on issues related to pediatric oral health. The purpose of this study was to pilot an innovative collaborative service-learning experience (ICSL) that addressed pediatric oral health issues among dental hygiene (DH) and primary care nurse practitioner (NP) students.

## Methods

The Old Dominion University Institutional Review Board and Human Subjects Committee approved this pilot study. A descriptive study design was used to examine DH and NP students' interprofessional socialization using the Interprofessional Socialization Valuing Scale (ISVS) following an innovative collaborative service-learning (ICSL) experience. The target population for this study was a convenience sample of dental hygiene (DH) and nurse practitioner (NP) health professional students enrolled in their respective summer clinical/practicum courses. Students from the DH and NP programs received an invitation to participate in the "Children's Oral Health Day" service-learning activity via their course website. Consent was

implied through students' positive email expressing interest to participate in the event and completion of the anonymous pre-post survey instruments delivered through the learning management system.

### *Innovative Collaborative Service-Learning Activity*

The ICSL activity was grounded in the interprofessional education collaborative (IPEC) core competencies, which guide interprofessional curriculum development among health professional programs including dentistry and nursing.<sup>16</sup> The four IPEC core competencies include values/ethics, roles/responsibilities, interprofessional communication, and teams and teamwork.<sup>16</sup> The core competency, roles and responsibilities, were the underpinnings of the ICSL experience for this study. Student learners shared their overall roles and responsibilities, as well as their role in addressing pediatric oral health. The ICSL activity was developed and supported by an interprofessional team of dental hygiene and nursing faculty members in addition to a cohort of pre-school teachers. Prior research focusing on pediatric oral health education for NP students, suggested a next level approach is to provide student-led collaborative service-learning activities allowing for the integration of knowledge and skills of dental hygiene and NP students.<sup>6</sup> This project sought to address this gap by providing students an opportunity to engage in a service-learning activity requiring a collaborative approach.

The service-learning activity focused on pediatric oral health for pre-school age children and consisted of two parts, development and delivery. The content development and the delivery activity was led by DH and NP students with the guidance of faculty members from the schools of dental hygiene and nursing. Due to the distance-learning structure of the advanced practice nursing program, the development of the service-learning activity occurred online through the learning management system (Blackboard Inc.; Washington, DC). The site "My Professional Learning," was created and facilitated by the DH/NP faculty members for the content development and ICSL activity planning. The DH and NP students were able to review all the required content and necessary materials for the pediatric oral health educational service-learning activities through this portal.

The director of the Child Development Center (CDC) and faculty members responsible for classes with children aged 3-5 years were invited to participate in the ICSL project titled, "Children's Oral Health Day." Three classrooms were identified with a total of 52 preschool children ages 3-5 years. Each child's caregiver was given an information packet with an overview of the "Children's Oral Health Day" activity, informed consent for their child to participate and consent for

a fluoride varnish treatment. Caregivers were given four weeks to return packets and the completed packets were collected by the Child Development Center (CDC) faculty/staff. A total of 44 preschool children participated in the “Children’s Oral Health Day.”

Students who volunteered to participate in the ICSL activity, were invited to the, “My Professional Learning” page in the learning management system. The DH and NP participants completed a series of online interactive activities that were led by dental hygiene and nursing faculty members in preparation for the ICSL activity. Student teams reviewed posted presentations on pediatric oral health care and the value of interprofessional collaboration between DH and FNP/PNPs, dental indices with charting activities, and instructional videos on fluoride varnish application technique. Dental hygiene faculty members also provided a briefing on the oral screening and fluoride varnish application on the day of the event.

The online activities were designed to allow for interprofessional education and collaboration to occur by providing a virtual platform for learning about the importance of pediatric oral health care, from and with each other.<sup>17</sup> Students were asked to describe their background, education, and roles and responsibilities of their respective disciplines using a voice tool in the learning management system. Teams of DH and NP participants learned from and with each other by collaborating on the development of educational materials and interactive activities addressing pediatric oral health for preschool-aged children for use at the ICSL activity.

Dental hygiene and NP student teams delivered hands-on learning and activities at five stations including role playing of pediatric dental visit with dress up/mirror/materials utilized in the dental office, illustrations of healthy eating habits, healthy oral hygiene practices including teeth brushing and flossing, oral screening and fluoride varnish application, and a scavenger hunt/tour of the dental hygiene care facility. Participants completed an “oral health” report card for each child outlining the results of the oral screening. The DH and NP teams applied fluoride varnish at the conclusion of the oral screening to those children who had parental consent. Faculty members from both disciplines supervised all activities. There was a face to face debriefing at the conclusion of the event with faculty members and students present as well as an online discussion forum within the learning management system. Participants were able to provide narrative comments to capture their overall ICSL experience and responded to peers’ postings. Participants were also asked to provide overall feedback regarding the experience at the conclusion of the post- survey.

### ***Survey Instrument***

The Interprofessional Socialization Values Scale (ISVS9A/ISVS9B) surveys measure beliefs, attitudes and behaviors related to interprofessional collaborative team practice.<sup>18</sup> Participants’ demographic information including as age, gender, and specialty program was also collected. The Interprofessional Socialization and Values Scale (ISVS) was initially developed as a 21-item scale to be used for longitudinal data collection. Initial testing of the 21-item scale included in a sample of 124 health professions students and demonstrated reliability with a Cronbach’s alpha ranging from 0.79 to 0.89.<sup>18</sup> Further development of the ISVS included shortened equivalent forms to utilize in pre/post testing in an effort to reduce respondent burden and threats to validity.<sup>19</sup> Equivalent subscales (ISVS-9A & ISVS-9B) were tested and demonstrated agreement with ICC-.970, 95% CI .963-976 for health professions students.<sup>19</sup> The ISVS-9A and 9B ask respondents to indicate “the degree to which you hold or display each of the beliefs, behaviors, and attitudes that are described” on a 7 point- Likert scale with a range of 0-7 (0=Not Applicable, 1=Not at all, 7-to a Very Great Extent).<sup>19</sup> Both on the ISVS-9A and ISVS-9B individual item scores are summed and divided by 9 for an average overall score with a minimum score of 0 and maximum score of 7.<sup>19</sup> In this study, the mean score for each individual item and overall mean sum score for the ISVS-9A and ISVS-9B were calculated for the sample.

### ***Data Collection and Analysis***

Participants completed the anonymous surveys (ISVS 9A/9B) in the learning management system prior to and following the ICSL activity. Participants entered their own unique ID for the pre/post-test surveys to allow for matched responses and were also given the option to ‘opt in’ or ‘opt out’ of having their responses included in future research analysis reported in aggregate. Descriptive statistics were used to analyze the data. Wilcoxon sign-ranked tests were used to examine statistically significant difference between the pre-ISVS 9A and post-ISVS 9B average total scores for all participants. Statistical significance was set at  $p=0.05$ ; Excel (Microsoft; Bellevue, WA) and SPSS V.25 (IBM; Armonk, NY) were used for data analysis.

### **Results**

Twelve participants (n=9 DH and n=3 NP students) completed the ISVS-9A prior to participating in the ICSL experience (n=12, 100%) and ten participants (n=8 DH and n=2 NP students (n=10, 83%) completed the ISVS-9B following the ICSL experience. In general, the participants’

level of agreement ranged from “to a fairly great extent” – “to a very great extent” for all statements in the ISVS 9A-9B surveys. The mean ISVS 9A scores prior to the ICSL experience ranged 5.50-6.45 for all participants. Prior to the ICSL experience participants scored the lowest level of agreement (5.50) with the statement, “*I have gained an enhanced awareness of roles of other professionals on a team.*” When stratified by discipline, similar findings were observed (DH = 5.67, NP = 5.00). The highest level of agreement (6.45) was observed with the statement, “*I believe that the best decisions are made when members openly share their views and ideas.*” This was also the highest overall level of agreement (6.62) for DH students. After participating in the ICSL experience, the mean ISVS 9B scores for all participants ranged from 5.80-6.80. Learners scored their lowest level of agreement (5.80) with the statement “*I see myself as preferring to work on an interprofessional team.*” This was also the lowest overall level of agreement (5.75) for DH students. The second lowest (5.80) level of agreement for all participants was observed with the statement, “*I have gained a better understanding of the client’s involvement in decision making around their care.*” This statement was the lowest level of agreement among NP students (4.50). The highest level of agreement for all participants (6.80) and within the disciplines (DH = 6.75 and NP = 7.00) was the statement, “*I believe that it is important to work as a team.*” Levels of agreement for the disciplines are shown in Table I.

Overall, positive changes were observed between the total pre ISVS scores (M=5.97, SD=0.55) and post total post ISVS scores (M=6.33, SD=0.74). However, this difference, (0.42) was not statistically significant (T=-1.83,  $p=0.066$ ). This positive change was also reflected in the specific discipline (DH 0.28, NP 0.54). Among dental hygiene students, there was a marginal statistically significant difference among DH participants’ pre-post ISVS scores (T=-1.89,  $p=0.058$ ) but not the NP participant scores (T=-1.61,  $p=0.106$ ).

## Discussion

Overall, this pilot ICSL experience demonstrated a positive impact on student values and socialization related to interprofessional collaborative practice with regards to the pediatric oral health care needs for children in the community. Prior to the ICSL experience the participants had their lowest level of agreement with the statement “*I have gained an enhanced awareness of roles of other professionals on a team,*” which suggests that both groups of students had some prior interprofessional collaborative experience before the ICSL activity. While the combined score for all participants was high (5.80) individually, the mean score for NP students

was lower (5.00) as compared to DH participants (5.67), which may be indicative of the level of interprofessional education experiences or exposures within the individual disciplines. While the demographic questions did not collect prior interprofessional education experiences, including this information in future studies will provide information on similarities and differences in previous exposures to interprofessional experiences across the health care disciplines.

All participants had the highest level of agreement with the statement “*I believe that the best decisions are made when members openly share their views and ideas*” prior to the ICSL experience. This finding suggests the participants highly valued collaboration, which was reflective in how ideas were exchanged in the development and delivery of the learning activities. Both DH and NP participants had their highest level of agreement with the statement, “*I believe that it is important to work as a team,*” implying that both groups of students value the benefits of teamwork. In this study, the participants had to collaborate on both the development and the delivery of oral health learning activities or pre-school age children. Overall, the qualitative student feedback was positive and indicated that this level of engagement within an interprofessional team was appropriate for their professional development and valuable to improving skills and confidence in preventative oral health with pediatric populations.

Previous literature demonstrates that university based interprofessional education for students in the health professions is feasible and effective.<sup>20-21</sup> The literature highlights the necessity of including interprofessional competencies in graduate nursing education to ensure that advanced practice registered nurses are ready to practice effective team-based care.<sup>22</sup> Similarly, in the dental hygiene profession, the Commission on Dental Hygiene (CODA) accreditation standards for dental hygiene education programs require that students be competent in “communicating and collaborating with other members of the healthcare team to support comprehensive patient care.”<sup>23</sup> Providing opportunities for collaborative patient care experiences to dental hygiene and nursing students are encouraged and/or required among the two professions. With regards to the dental hygiene profession, several national studies have examined activities, perspectives, and barriers related to interprofessional education in dental hygiene education programs.<sup>24,25,26</sup> In the Furgeson et al. national survey of dental hygiene program directors, it was found that roughly 90% of nursing schools were located within institutions where dental hygiene programs were also a part of the institution and collaborating with a nursing school was the most commonly reported for dental hygiene programs.<sup>24</sup> A similar finding was also identified in the Tolle

Table I. Pre- and post survey scores for dental hygienist and nurse practitioner student participants

ISVS-9A(pre) and ISVS-9B(post) average scores by item							
ISVS-9A (pre)	All Participants (n=12) Mean (SD)	DH (n=9) Mean (SD)	NP (n=3) Mean (SD)	ISVS-9B (post)	All Participants (n=10) Mean (SD)	DH (n=8) Mean (SD)	NP (n=2) Mean (SD)
I am able to share and exchange ideas in a team discussion.	5.92 (1.16)	6.00 (1.22)	5.67 (1.16)	I have gained an enhanced awareness of my own role on a team.	6.10 (1.10)	6.25 (1.16)	5.5 (0.71)
I have gained an enhanced perception of myself as someone who engages in interprofessional practice.	5.67 (0.78)	5.89 (0.60)	5.00 (1.00)	I feel comfortable being the leader in a team situation.	6.30 (1.06)	6.25 (1.16)	6.5 (0.71)
I feel comfortable in speaking out within the team when others are not keeping the best interests of the client in mind.	6.08 (1.00)	6.11 (1.05)	6.00 (1.00)	I see myself as preferring to work on an interprofessional team.	5.80 (1.14)	5.75 (1.28)	6.00 (0.00)
I believe that the best decisions are made when members openly share their views and ideas.	6.45 (1.04)	6.62 (0.74)	6.00 (1.73)	I have a better appreciation for the value in sharing research evidence across different health professional disciplines in a team.	6.70 (0.48)	6.75 (0.46)	6.50 (0.71)
I feel comfortable in describing my professional role to another team member.	5.83 (1.03)	6.00 (1.12)	5.33 (0.57)	I believe that it is important to work as a team.	6.80 (0.42)	6.75 (0.46)	7.00 (0.00)
I have gained an enhanced awareness of roles of other professionals on a team.	5.50 (1.31)	5.67 (1.50)	5.00 (0.00)	I am able to negotiate more openly with others within the team.	6.40 (0.84)	6.37 (0.92)	6.50 (0.71)
I have gained an appreciation for the importance of having the client and family as members of a team.	6.17 (1.11)	6.11 (1.17)	6.33 (1.15)	I feel comfortable in being accountable for the responsibilities I have taken on.	6.60 (0.70)	6.62 (0.74)	6.50 (0.71)
I am comfortable engaging in shared decision making with clients.	6.08 (0.67)	6.22 (0.67)	5.67 (0.57)	I have gained a better understanding of the client's involvement in decision-making around their care.	5.80 (1.55)	6.12 (1.36)	4.50 (2.12)
I feel comfortable in accepting responsibility delegated to me within a team.	6.08 (0.67)	6.22 (0.67)	5.67 (0.57)	I feel comfortable in clarifying misconceptions with other members of the team about the role of someone in my profession.	6.50 (0.53)	6.50 (0.53)	6.50 (0.71)
ISVS-9A and ISVS-9B final scores for both groups							
ISVS 9A (pre) Total Score	All Participants (n=12) Mean (SD)	DH (n=9) Mean (SD)	NP (n=3) Mean (SD)	ISVS-9B (post) Total Score	All Participants (n=10) Mean (SD)	DH (n=8) Mean (SD)	NP (n=2) Mean (SD)
	5.98 (0.28)	6.09 (0.26)*	5.63 (0.45)		6.33 (0.37)	6.37 (0.32)*	6.17 (0.75)

\*Marginal statistically significant difference was observed among dental hygiene students (p=0.058).

et al. study where nursing programs were the most commonly reported program for interprofessional activities.<sup>26</sup> In the Furgeson et al., study, volunteer activities were the most frequently reported interprofessional event between dental hygiene and other disciplines. With regards to service-learning projects, half of the respondents reported service-learning projects as a vehicle for interprofessional education between dental hygiene and other disciplines.<sup>24</sup>

Documented efforts of IPE activities between dental hygiene and nurse practitioner students are scarce, specifically in the area of pediatric oral health. In addition to identifying appropriate programs for collaboration, scheduling coordination has been a highly reported challenge among dental hygiene programs for integrating interprofessional education experiences.<sup>24</sup> This study addresses these gaps by highlighting a cost-effective innovative approach that can be used to overcome challenges shared among health professions in creating interprofessional education opportunities for students. However, future research should include a larger student learner cohort and a longitudinal look at changes in beliefs, values and attitudes related to interprofessional education that are needed to demonstrate meaningful change that can impact professional development and patient care outcomes. Dental hygiene and NP faculty members should continue to utilize the service-learning platform for meaningful interprofessional educational initiatives among DH and NP students focused on integrated pediatric oral health care.

This study has limitations. The small sample size, particularly the NP participants, limits the generalizability of the results. Since the majority of NP students were completing their coursework online and were living at a distance from the university, it was a challenge to obtain an equal number of participants to match the DH students. However, based on the number of pre-school age students and classes within the child development center, the overall number of participant groups was appropriate. Future efforts should include coordinating the ICSL activity with the NP's other required on-campus activities to increase NPs participation. However, while the virtual learning and collaboration component for the ICSL activity was not a challenge; the in-person component of the ICSL activity can be a barrier. Schedule coordination is a reported challenge in the literature for developing interprofessional activities. The use of virtual technology for preparation and delivery of education or care is one strategy to leverage scheduling conflicts while providing students with enriched interprofessional experiences. Considering these limitations, this was the initial pilot of an interprofessional service-learning activity with DH and NP students focused

on pediatric oral health that did not require a significant investment of resources (i.e. money) or faculty workload (i.e. time). Although this pilot project was limited to a small number of volunteer participants, positive changes in values and socialization related to interprofessional education and collaborative care were appreciated after participation in this ICSL experience.

## Conclusion

This ICSL experience provided important opportunities for DH and NP health profession students to engage in preventive pediatric oral health care collaboratively. Early childhood preventive oral health care represents a key area for interprofessional collaborative practice in primary care settings. Socialization to interprofessional collaboration in early in the health professions education process is an important component in facilitating future success with collaborative patient-centered care. Interprofessional education efforts are occurring within dental hygiene education programs however, more studies are needed to document the specific types of interprofessional activities along with the core competencies used. This low resource, service-learning educational project has potential for easy integration within dental hygiene and advanced practice nursing curricula.

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