

The Effect of an Interprofessional Hospital Rotation on
Senior Dental Hygiene Students' Interprofessional Identity

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DEDICATION

This thesis is dedicated to my partner Aaron, my parents, and my grandma. I could not have made it through this journey without your love and support.

ABSTRACT

Objectives: With the emerging evidence that oral health is inextricably linked to general health, dental hygienists are gaining attention as key players on the primary healthcare team. Successful collaboration in such interprofessional (IP) teams require dental hygienists to be comfortable practicing outside of the traditional clinic setting. Measuring the interprofessional identity (IPI) of dental hygiene students is integral to understand whether interprofessional educational efforts are adequately preparing them for effective practice in IP teams.

Methods: A pretest-posttest survey design was implemented to measure changes in University of Minnesota senior dental hygiene (DH) students' IPI before and after an interprofessional hospital rotation. Changes in pretest-posttest scores were measured using the Extended Professional Identity Scale (EPIS) (1).

Results: The interprofessional hospital rotation resulted in a statistically significant increase in senior dental hygiene students' total IPI, and the subcategories of IP belonging and IP commitment. Qualitative findings corroborated quantitative results, citing knowledge, respect, and inclusion as primary factors impacting their IPI.

Conclusion: An interprofessional hospital rotation has a positive impact on senior dental hygiene students IPI. Results suggest IPE in hospital settings facilitate dental hygiene students' IPI development, preparing them for future practice on interprofessional teams and in non-traditional settings. Large longitudinal studies are needed to investigate the sustainability of dental hygiene students' IPI after graduation.

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SECTION ONE

INTRODUCTION

With growing evidence linking oral health to systemic health, dental hygiene institutions are recognizing the need to prepare students to collaborate efficiently on multidisciplinary health care teams (2–5). Graduates will be expected to be competent in interprofessional collaborative practice, which is defined by the World Health Organization as “multiple health workers from different professional backgrounds [working] together with patients, families, [caretakers] and communities to deliver the highest quality of care” (6). A common response to the demand for successful interprofessional collaboration (IPC) in health care is the development and implementation of interprofessional education (IPE) in the educational or workplace setting. IPE is an environment created by both healthcare educators and learners from at least two different disciplines to learn from, about, and with each other for effective collaboration and improved health outcomes (6,7). The goals of IPE are to “develop knowledge, skills and attitudes that result in interprofessional team behaviors and competence”(7). These goals are intrinsically linked to The Triple Aim of Healthcare which seeks to “improve the patient experience of care, improve the health of populations, and reduce the per capita cost of health care” (8,9). However, recent research has found strong uni-professional identities within multidisciplinary groups may be problematic for successful outcomes of IPE and hinder IPC (10–12).

As students progress through their education, they move through successive stages of professional identity (PI) development (13). Several factors contribute to the stages of PI development and strength, including clinical exposure, role modeling, and inclusivity/exclusivity of professional groups (14–22). Traditionally, healthcare students

are taught in “silos”, separated from other disciplines for the majority of their schooling, which can lead to students developing a strong “uni-professional” identity, believing their profession is separate and superior to others (23). A strong uni-professional identity developed from profession-specific learning environments can result in poor communication and collaboration within IP teams due to enhanced perception of PI threat (23). Threats to PI including role blurring, and professional identity deterioration from IPE can lead to “turf protection” behavior, hindering successful IPC (11,24,25). While it is important for an individual to develop a primary PI within their professional program, it may not be an appropriate goal in IPE. Experts suggest students have the ability to develop a separate interprofessional identity, extended from their concurrently developing professional identity (1,12,23,26).

Recent research suggests IPE experiences should focus on facilitating the development of an interprofessional identity (IPI) as a predictor of positive outcomes on interprofessional teams (23). Based on the Extended Professional Identity Theory (EPIT) proposed by Reinders et al., an IPI is a social identity separate from profession-specific PI (26). The EPIT describes IPI as a “*social identity* based on a widening circle of group membership that consists of more than one profession” (26). Reinders et al., posits IPC can be enhanced with comparative group feedback between mixed profession groups, which can result in decreasing dominance between professional subgroups (26). The social identity of IPI consists of three interrelated characteristics: interprofessional commitment, belonging, and beliefs (26). Instruments frequently used in IPE research only focus on one or two of these characteristics, never all three (1). Reinders et al. used

the EPIT as a framework to create a new instrument to measure IPI, on the basis of the three aforementioned characteristics of IPI (1).

To prepare dental hygiene (DH) students for a future in interprofessional practice, the University of Minnesota requires an IPE rounding experience at the University of Minnesota Fairview hospital. During this rotation, students collaborate with medical teams comprised of medical faculty, residents and students, pharmacy students, and oral surgery residents to identify manifestations of systemic diseases, conduct bedside oral assessments, and develop oral care plans. Additionally, students shadow a hospital dental hygienist providing dental hygiene consult services for medical/surgical teams. This rotation serves as an IPE experience for DH students to develop their interprofessional skills with members of the healthcare team and prepare them for future practice.

Currently, no study has been conducted to measure changes in all three characteristics of IPI to assess the educational outcomes of an IPE hospital rotation in DH students. Further exploration of whether or not the hospital rotation affects the three characteristics of DH students' IPI is needed to understand the impact of IPE on students' developing IPI. Findings could inform interprofessional hospital rounding in a variety of institutions across the country. To that end, this study will explore the IPI of DH students at the University of Minnesota before and after participating in a required, embedded IPE hospital rotation.

The Extended Professional Identity Theory (EPIT) will be used as a theoretical framework to guide this study, and to understand how IPI is influenced by an IPE experience, such as the hospital rotation. Evaluating an IPE experience addressing the

constructs of the EPIT may serve to assess outcomes of IPE educational objectives and provide guidance for program design and implementation.

Purpose of Study

Using both quantitative and qualitative data, the purpose of this research is to determine the impact of an interprofessional hospital rounding experience on DH students' interprofessional professional identity (IPI) as measured by change in interprofessional commitment, belonging, and beliefs, using the new EPIS instrument (1).

Statement of the Problem

A growing body of evidence supporting the connection between oral and systemic health has prompted calls for the integration of medicine and dentistry (2–5). With this emerging research, dental professionals of the future must feel confident collaborating on healthcare teams, practicing in non-traditional practice settings, and hold a strong interprofessional identity (3–5,27). In an effort to strengthen IPC, foster interprofessional communication skills, and advocate for dental professionals on the healthcare team, the University of Minnesota provides dental hygiene students with an IPE rotation with University hospital medicine teams. Ideally, this interprofessional rotation will strengthen students' interprofessional identity as members of the healthcare team, as well as prepare them to meet the growing complex healthcare needs of the population. However, the effect of this rotation on DH students' IPI is unknown and has not been studied. If IPI is unaffected or weakened by these types of interprofessional experiences, graduates may not be adequately prepared for the changing demands of the profession and fall short of meeting the public's complex healthcare needs. Gathering qualitative and quantitative data will provide insight into how DH students' IPI is affected by this IPE experience.

Understanding how DH students view their identity as a member of the interprofessional healthcare team will allow educators to design curriculum and future IPE experiences ensuring dental hygienists are prepared for the everchanging and complex healthcare demands of the future.

Significance of the Study

Historically, oral health has been seen as separate and peripheral from systemic health (28,29). However, with emerging evidence that oral health is inextricably linked to overall health, dental hygienists are now gaining attention as key players on the primary healthcare team (3). Future dental hygienists need to be prepared to work in environments outside traditional dental practice settings, providing collaborative care for medically compromised patients. (3). It has been recognized that dental hygienists working with hospital-based healthcare teams have potential to improve patient well-being and improve collaboration between providers (27,30–32).

Dental hygiene curricula has primarily emphasized employment in private practice settings, where less interprofessional collaboration occurs (3). Dental hygiene institutions are recognizing the shift in roles and responsibilities of future dental hygienists and are designing IPE experiences to prepare dental hygienists for this changing profession (3). It is imperative that dental hygiene curriculum and educational experiences adequately support the strengthening of the dental hygienists' interprofessional identity as part of an interprofessional healthcare team (3). Research regarding the influence of educational IPE experiences on dental hygiene students' interprofessional identity is lacking. With limited research in this area, it is possible an entire generation of dental hygienists will emerge into the profession ill-equipped to

collaborate confidently on an interprofessional team, failing to meet the healthcare demands of the population. Not only will this have a detrimental effect on the populations' oral and systemic health, but the assumption that medicine is separate from dentistry will be perpetuated.

Research Question

How does an interprofessional collaborative rotation with a hospital medical team affect dental hygiene students' interprofessional professional identity as measured by the EPIS?

Hypothesis

Ho: An interprofessional collaborative experience with a hospital medical team will have no effect on dental hygiene students' interprofessional identity as measured by the EPIS.

Ha: An interprofessional experience with the hospital medical team will have a positive effect on dental hygiene students' interprofessional identity as measured by the EPIS.

Pre-known Limitations

Pre-known limitations of this study include variability of patient encounters for each student rotation; this includes number of patients seen, variability of systemic medical conditions, opportunity to perform an oral assessment, and number of patients available for oral assessments. Additional limitations include the variability of medical teams in regard to their knowledge of the rotation expectations, willingness to be inclusive, lack of IPI held by medical team, and stereotypes held by dental hygiene students and the medical team. Variation of attitudes amongst teams could impact collaboration and development of the IPI in DH students.

SECTION TWO

REVIEW OF THE RELATED LITERATURE

Professional identity (PI) is described as one's professional self-concept based on beliefs, attitudes, norms and values shared among others in the same professional group (33). Crossley et al. describe PI as a 'state of mind' which allows an individual to identify as a member of a professional group (34). In order to become a confident professional, students need to develop a strong PI before graduating from a professional program (34). A commonly agreed upon notion is that PI is not formed all at once, but rather formed along a continuum, with external and internal factors affecting this development (17). The exact time in which one starts to develop a PI is not agreed upon, however, there is general agreement that formal education and the experiences within the curriculum serve as primary factors in shaping PI (14,17,20,33). With a growing demand for integrative, multidisciplinary healthcare models, interprofessional educational (IPE) experiences are becoming more common in healthcare institutions, which may have an impact on PI development (3).

IPE supports interprofessional collaboration (IPC), which is a patient centered care approach that utilizes team members across the health professions to work together for the goals of improving the quality of patient care, lowering costs, reducing medical errors, and shortening length of patient stay (35). Recognition of the oral-systemic relationship and the success of interprofessional collaboration is driving the integration of our health care system, and consequently, dental hygienists of the future will need to be able to collaborate efficiently with members of the primary healthcare team. (3). Because healthcare students are learning and socializing with members from their own profession the majority of the time, PI is often formed in a silo, away from other healthcare

disciplines (23). As a response to this observation, educational institutions have implemented curricular changes to provide opportunities for healthcare students to learn with others outside of their healthcare discipline via IPE experiences. To adequately prepare novice professionals to practice in this changing healthcare climate, it is important to gain an understanding of how professional and interprofessional identity is formed in healthcare students, what impacts identity development, and the role of IPE in professional and interprofessional identity development. While there is a paucity of research concerning interprofessional identity formation of dental hygienists, understanding how professional and interprofessional identity in other healthcare disciplines is formed and influenced can be useful for planning and implementing dental hygiene curricular activities that promote preparedness for interprofessional collaborative practice.

A database search was conducted on Google Scholar and Pub Med. Search criteria included “professional identity, healthcare students, dental hygiene, interprofessional collaboration, education, socialization, development, interprofessional education, interprofessional identity, dual-identity”. Studies were limited to English and human subjects only. Studies were still included if they did not include dental hygiene students as subjects, as connections can be made between dental hygienists and other healthcare disciplines. The inclusion criteria for this review consisted of peer reviewed literature, students in the allied health professions as the subjects, professional identity and interprofessional identity development as the phenomenon being studied.

Theories of PI and IPI Formation

A critical aspect of becoming a professional is the formation of a professional identity (36). Individuals must be able to ‘think, act, and feel’ like they belong to their chosen profession (37). To understand how PI is formed, theories of human development must be examined. Vignoles et al. state the formation of a PI must be in line with the process of developing a personal human identity (38).

Robert Kegan’s theoretical framework for the Development of the Self postulates six stages of human identity development, extending from childhood into adulthood (13). The stages begin in infancy and are comprised of: incorporation, impulsion, imperial, interpersonal, institutional, and interindividual (13). The first stage, incorporation, occurs during infancy and places an emphasis on reflexes and sensory information, as the individual does not yet have a sense of self (13). The second stage, impulsion, is concerned with impulsive actions and developing meaning that objects have to the child (13). Stage three, imperial, is focused on the child’s desires to act in a self-centered way that is driven by their own wants (13). The interpersonal stage, stage four, is when the individual becomes aware and mindful of others and their needs, including the development of empathy and compassion (13). In stage five, institutional, the individual starts to develop a moral compass comprised of values and ethics (13). The individual acts less on impulse, and more on principle. The final stage, interindividual, focuses on acceptance and understanding of others’ values, while emphasizing their own autonomy and tolerances (13). Each stage is shaped by the preceding stage, and as one progresses through these stages, a sense of identity is developed (13,39).

Kegan’s theory has been adapted for medicine and dentistry to explain the successive stages of professional identity formation (40–43). Similar to human

development, PI is thought to develop in stages rather than all at once (38,40). Even before students begin their professional education, students start to identify with their chosen profession. Acceptance into professional programs mark the beginning of the socialization process in which students start to develop their PI (13,44).

In a qualitative study by Weaver et al., medical students reported having a weak PI in their first year, but noticed a gradual increased sense of belonging as they progressed through the curriculum (17). Cruess et al adapted Kegan's theoretical framework to describe the sequential formation of a medical professional identity as occurring between Kegan's stages of 2-4 (40). The authors posit that students progress through developmental stages, starting from an imperial role, in which their own needs and interests are of utmost priority (40). Students in this first stage of professional identity development are able to assume the roles of their profession, but rules and correctness serve as their primary motivation (40). Often times in this stage, emotions may cloud reason in decision-making and actions (40). Next, students enter the interpersonal stage, where they have an ability to recognize multiple perspectives simultaneously (40). Students in this stage are primarily concerned about how others view them, are self-reflective, and seek out role-models to emulate (40). Lastly, students enter an institutional role where external values of the profession have become internalized, and actions are fully controlled by reason rather than emotion or desires (40).

Socialization theories. A primary dimension of PI formation is the socialization process, which can be defined as "the social conditioning of the human personality, as contrasted with physical maturation" (45). The socialization process contributes to a forming PI,

where individuals begin to acquire attitudes and values of the profession (46). The Social Identity Theory (SIT) is a commonly cited theory in the literature concerning PI development and socialization (47). The main focus of the SIT is the emphasis of group belongingness as a result of intergroup relations and self-categorization into a profession-specific 'in-group' (10,23,47,48). This theory can be applied to the research by Weaver et al. who found social exclusivity, due to socialization into a specific group, to be a strong component of professional identity formation in first and third year medical students (17). Authors found a reinforcing relationship between experiences, professional inclusivity, and social exclusivity, which led to a defined sense of professional identity (17).

With qualities similar to the SIT, the Self-Categorization Theory (SCT) has also contributed to the literature on professional identity formation (49). The SCT states that a self-identity is comprised by both personal and social identity (49). Personal identity is regarded as self-descriptors of personal attributes, where social identity is described as self-descriptors referring to group membership or self-categorization in a particular group (49). An individual's social identity is not permanent, and the category in which one feels they belong to may change based on relevance or interpretation of a situation (49). Certain "cues" remind a person of their group membership, which triggers salience of their belonging to a certain group, and as such, their social identity (49). A professional identity is a social identity which consists of three characteristics: commitment (attachment), belonging, and beliefs (50). Measures of commitment to a group highlights one's "perceptions of the intensity of their connection to that category" (50, p 4). Belonging can be operationalized as a "recognition of membership to a social category" (50, p 4). Whereas commitment and belonging can be generalized, beliefs are specific to

the profession and “consist of evaluations of what is good, legitimate, and appropriate” (50, p 6). The SCT theorizes that a person can identify as a member of their professional group as well as a larger social category, such as an interprofessional group, existing in complementary social identities (49). Therefore, before exploring IPI development, it is important to first understand the key factors that impact PI development. Research pertaining to the development of physicians, nurses, and other healthcare professionals may be used to inform the PI development of dental hygiene students (51). Factors impacting PI development include clinical exposure, role modeling, and personal inclusivity/social exclusivity.

Factors Impacting PI Development in Healthcare

Research has shown that clinical experiences are a major contributing factor to PI development in the literature (15–20). Early exposure to healthcare settings, involvement in clinical tasks, and hands-on training experiences are shown have been shown to influence medical, nursing, and dental students’ development of PI in their respective professional fields (15–20). Adams et al. found first year health and social science to have a higher baseline PI at the time of acceptance into professional programs if they had previous experiences in healthcare settings (33). Clinical exposures, including involvement in clinical tasks, are regarded in the literature as being the first step toward medical students’ PI development, especially if experienced early in their professional education (15,17,20,52). The act of performing profession-specific tasks has been shown influence medical students’ sense of belonging in the (15,52). Kay et al. found medical students shift their PI from that of a student, to that of a doctor once the learning environment changed from classroom to clinical setting (53).

In nursing education, hands-on clinical experiences were also shown to play an integral role in PI development (54,55). Working alongside medical teams in a hospital setting allowed nursing students from one study to gain a better understanding of their professional roles and responsibilities, resulting in a positive impact on their developing PI (54). Characteristics of clinical exposures including duration, quality, and quantity of the experiences have also been linked to an improved sense of belonging and development of a PI in nursing students (54–56) The 2014 study by Milton-Wildey et al. identified clinical placements along with facilitation and support from role models as integral components for the development of a PI for nursing students (56).

A survey of dental students revealed a heightened sense of PI after completion of clinical rotations (57). Participation in hands-on clinical experiences challenged their assumptions, confronted them with ethical dilemmas, and raised their awareness of the complexities involved in clinical care (57). Morison et al. explored dental professional students' perceptions of roles and identities, and found the amount of previous clinical experience to be a key determinant in PI development (58). Compared to dental and dental assisting students, dental hygiene students were found to have the strongest sense of PI, largely derived from the role models present in their clinical experiences (58).

~~Role modeling is an integral part of becoming a professional and~~ has been shown to have a powerful contribution to PI formation and development (14–18,55). Clinical experiences in medical and dental education provide opportunities for role modeling to occur. Demonstrations from faculty and staff of professional programs provide students with inspiration, contributing to changing attitudes and the developing PI (14,16). Novice professionals learn from role models by “echoing” communication and behavioral norms

observed within their professional field (22). Observing professional role models in the clinical setting has shown to help medical students learn about professionalism. Further, PI has shown to be significantly impacted when role models *included* medical students in clinical tasks, making them feel like part of the professional team (14,17). Along with role models, affirmation and legitimization from peers of their own professional group was found to be significant in medical students' PI development (14,59).

Stull et al. found an IPE course comprised of first year healthcare students resulted in worsening attitudes toward students' own profession, other professions, and IPE courses (43). Drawing on Kegan's stages of development, it was concluded the first year students may have been immature and insecure in their professional roles, leading students to grow defensive of their own professional identity out of fear of their professional roles being diluted in the interprofessional team (43). Stull et al. posit that the negative attitudes were a result of the necessary discomfort from IPE which challenges the stage of development students are currently in, facilitating advancement through the successive levels of PI (43). Similarly, Brown et al. reported interprofessional healthcare teams felt a heightened sense of "role blurring" during IPC, which brought about a concern for potential confusion in accountability (60).

Influence of PI on Interprofessional Collaboration

The success of IPE and IPC is influenced by profession specific PI within the interprofessional team (10,11). A large contributing factor in the poor performance of interprofessional teams is the perception of PI threat (10,11). Threat to PI can be defined as the "perception of risk regarding the diminution of a profession's expertise, values, or occupational role" (10 p 1325,60). Interprofessional teams who display higher levels of

PI threat have been found to demonstrate poor performance in teamwork (11). Conversely, interprofessional teams who displayed low levels of identity threat demonstrated a positive relationship and resulted in effective team function (11). Pate et al. studied community health partnerships (CHP) in Scotland to assess the extent to which employees identify with their own profession, and how differing levels of PI may act as a barrier to successful IPC (12). Survey results and interviews revealed participants displayed heightened levels of individual PI as a response to the perceived attempt at diminution of their PI by the implementation of IPC (12). This perceived threat to PI led employees to identify more with their own profession, rather than with the interprofessional team (12). Baker et al. found some physicians participating in IPC felt the need to defend their professional identity was more important than finding common ground within the interprofessional group (62). “Turf protection” behaviors resulting from PI threat are amongst the most common reason for poor outcomes of IPC and IPE (10,11,23). Participants in the study by Pate et al. displayed resistance to successful integration of IPC because of the perceived need to defend their profession and what they understood it to be (12). The blurring, or sharing, of professional roles commonly seen in interprofessional care can be perceived as a threat to one’s individual PI, and a push for assimilation into a dominant, interprofessional culture (10).

In-group and Out-group Bias

Feeling a sense of belonging and a degree of social exclusivity was found in the literature to be a key factor in the development of healthcare students’ PI development. Social exclusivity, or feeling one’s group is separate and different from others, has proved to be a major influence on medical students’ sense of PI (17). Isolation from other

disciplines in the university setting leads to strong peer inclusivity and a shared exclusive PI (17). Profession-based isolation in healthcare education can lead to ‘in-group’ attitudes and behaviors that may affect future professionalism and participation in IPC (21,23,33). Being a part of an ‘in-group’ can be extended to findings by Lingard et al. (22). In the exploration of multidisciplinary communication in the operating room, it was found the developing PI of novices are affected by how members of the ‘in-group’ interact with members of the ‘out-groups’ (22). PI formation is therefore shaped by the construction of categorizations by the novice to members of the ‘out-groups’ (22). McNeil et al. posit diversity of PI within an interprofessional team can lead to categorization of “in-groups” and “out-groups”, which can impair group function (10,11).

In coherence with the SIT proposed by Tajfel and Turner, individuals learn to identify with their specific profession resulting in “in-group” favoritism, and “out-group” bias and distrust, which can hinder successful IPC (10,47). As mentioned by Lingard et al., novice professionals learn and “echo” behaviors and beliefs of role models within their profession, which can lead individuals to construct ideas and beliefs about other professional identities in relation to their own (22). These constructs can lead to oversimplifications about one’s own profession (in-group) or another professional group (out-group), which has the potential to decrease the ability to work well as a team (22). Khalili et al. posit the profession-specific environment in which individuals socialize contributes to the formation of an isolationist ‘in-group’ identity known as a ‘uni-professional identity’. (23). Strong uni-professional identities result in negative biases, attitudes, and stereotypes toward other professionals, hindering successful interprofessional teamwork (23,63). Callan et al. suggest the emphasis on a strong uni-

professional identity in professional curricula may not be valuable, as IPC demands healthcare professionals to work effectively as teams (3,64).

IPI Development

Instead of diminishing primary PI to promote successful multidisciplinary care, experts propose the idea of fostering the development of a dual identity as a viable solution in the context of interprofessional care (12). Khalili et al. define dual identity as “the development of a robust sense of belonging to both own profession (in-profession favoritism) and to the interprofessional community (interprofessional favoritism) in which individuals view themselves simultaneously as a member of their own profession, and the interprofessional team” (65, p 1). Barnard et al. states the ideal end point of a healthcare graduate is one who embraces the dual identity: one who confidently represents their own profession, and is a competent collaborator in an interprofessional team (66). The concept of developing a dual identity means students have the capacity to develop several identities concurrently, including a PI and an interprofessional identity (IPI) (12,23). Based on current definitions of dual identity, it is not clear whether IPI is a part of a dual identity, or whether dual identity is a part of an IPI (23,63,66). The idea of an IPI first came into focus in the late 1990s when professional identity development was conceptualized as fluid, with “permeable boundaries to accommodate interprofessionalism and interprofessional collaboration” (63 p1,67,68). A focus on the development of an IPI, in addition to the concurrently developing primary PI, would be a solution for the negative impacts strong primary PI may have on IPC teams.

Khalili et al. developed an interprofessional socialization framework to facilitate the development of a dual identity in healthcare professionals (23). Because strong uni-

professional identities have the potential to hinder IPC, Khalili et al. suggest implementation of interprofessional socialization (IS) strategies to promote the development of an IPI (23,69). The process of IS promotion involves engaging learners from multiple disciplines to learn together with, from, and about each other (23). IS creates a context for the development of an IPI, which is the first step for successful IPC (23).

The stepwise Interprofessional Socialization Framework (IPSF) consists of breaking down barriers, interprofessional role learning, and IPI development (23). Khalili et al. suggest the IPSF be embedded in professional education curriculum, with steps 1 and 2 as the focus in the early stages of the curriculum, and focus on IPI development in later stages (23). Such curricular changes in healthcare education are theorized by Khalili et al. to enable students to shift their socialization process to one that promotes the development of an IPI (23).

A 2020 study by Khalili et al. investigated the application of this interprofessional socialization framework on health students dual identity development (65). A significant increase in dual identity was found among healthcare students from seven different healthcare disciplines after participating in a IPE program that emphasized interprofessional socialization (65). As students' dual identity grew, they gained insights about how other healthcare professionals' roles and contributions are important to patient care (65). Investigators in this study emphasize the need for further research in this area to explore dual identity/interprofessional identity development on IPC and practice (65).

Reinders et al. has built upon the ideas of interprofessional socialization, the self-categorization theory (SCT) and others, to develop the Extended Professional Identity Theory (EPIT). This theory explains IPI development and offers practical suggestions to facilitate interprofessional behavior and identification (23,26,49). An IPI is defined as “a social identity based on a widening circle of group membership that consists of more than one profession” (25, 26 p 1). IPI is a social identity extended from a PI and is comprised of three characteristics: interprofessional commitment, belonging, and beliefs (26). Commitment, or attachment, “reflects an individual’s perception of the intensity of their connection” to a social identity or category, where as belonging “reflects a simple recognition of membership in a social category”. While belonging and commitment can be generalized to a variety of professions, beliefs are particular to the situation and profession; they consist “of evaluations of what is good, legitimate, and appropriate” in the context of one’s professional group (50, p 6).

The EPIT was developed as a special adaptation of the self-categorization theory (SCT) which emphasizes accentuation, or highlighting features that facilitate interprofessional behavior (26). Authors place an emphasis on IPI development through comparative group feedback in mixed profession groups, facilitated in a professional context (26). Comparative group feedback is a facilitated strategy “for influencing perceptions on interprofessional task distribution” (70). With comparative group feedback between mixed-profession groups, subgroup members are likely to identify with their mixed professional group, enhancing their IPI and decreasing profession-based dominance (1,26).

Measuring IPI

Measuring IPI is essential for practical and educational purposes (1). With the increasing demands for interprofessional collaboration, there is a great need for an instrument that can evaluate the outcomes and effects of IPE on changing and improving IPC behaviors (1,3). Using the EPIT as a theoretical guide, Reinders et al. also found the current methods used to measure outcomes of IPE to be problematic, as currently utilized instruments measure only one or two characteristics defining IPI, never all three (1). For example, the Dual Identity Scale (DIS) developed by Khalili et al. explicitly measures interprofessional belonging, but not commitment or beliefs (1,23). Commitment is found to be an essential component of ingroup identification and can influence behavior regardless of motivation or positive attitudes (1,26,71). Moreover, many researchers have used attitudes as an item to measure success of IPE which experts have found to be problematic (1,26). The use of problematic instruments to measure outcomes of IPE may result in inaccurate assessments of educational outcomes (1). No instrument at the time of the study by Reinders et al. measures commitment in IPE (1,71).

Similarly, a 2020 systematic review by Tong et al. investigated current conceptualizations, definitions and means to evaluate and measure IPI (63). The authors found that current instruments utilized to measure interprofessional identity have poor construct validity (63). For example, the Interprofessional Socialization and Valuing Scale (ISVS) measures interprofessional socialization based on the assumption that this socialization leads to an interprofessional identity, but does not explicitly measure identity itself (24,63). The ISVS measures the important processes of interprofessional socialization for interprofessional identity formation, however, only two of the subscales can be categorized as beliefs (1,24).

Additionally, the most commonly utilized instrument for interprofessional research, Readiness for Interprofessional Learning Scale (RIPLS), evaluates *attitudes* toward IPE but does not evaluate interprofessional or professional identity (63,72). This is problematic because simply changing the attitude toward IPE may not be a sufficient predictor of effective IPC (26). Additionally, this scale has also been found to have low reliability and weak validity (1). Tong et al. call for the development and utilization of a psychometrically-robust and theoretically driven instrument that measures IPI over time in order to advance interprofessional identity research (63).

Extended Professional Identity Survey. The Extended Professional Identity Survey (EPIS) is a new instrument, developed by Reinders et al., which measures interprofessional identity based on the three interrelated characteristics: interprofessional commitment, interprofessional belonging and interprofessional beliefs (1). The scale consists of existing or modified items from pre-existing scales, as well as new items to fill in gaps of information (1). Existing scales that were utilized to develop survey items include: the Dual Identity Scale, UME Interprofessional Questionnaire, Organizational Commitment Scale, Interprofessional Socialization and Valuing Scale, and the RIPLS (23,24,72–74). The EPIS measures the three interrelated characteristics of IPI as theorized by the EPIT (1,26). Authors identify a need for future research to utilize the EPIS to provide further evidence regarding its utility in measuring IPI in IPE settings (1).

Implications for Future Research

Research suggests by 2040, the need for dental hygienists working in the traditional practice setting will decrease as the demand for integrated medical/dental care rises with the populations' complex healthcare needs (3). This means more dental

hygienists will be needed to collaborate within interprofessional care teams in settings such as hospitals and long-term care facilities (3). With the knowledge of how a uni-professional PI can negatively impact IPC outcomes, there is a clear need to understand IPI development in dental hygiene students in the context of IPE.

The University of Minnesota's senior dental hygiene (DH) students participate in a hospital rotation alongside medical students, residents, fellows, pharmacy students, and other members of the healthcare team. The DH students participate in pre-round meetings and patient rounds, during which they conduct intra/extra oral assessments. DH students lead discussions with the medical team about the oral impact of systemic conditions, and collectively develop oral care plans with the medical team.

To prepare for the changes in our healthcare system, it is not sufficient to *only* study the PI development of DH students as it relates to IPE. As the literature reveals, it is possible for students to belong to multiple social identity groups, making it possible for DH students to develop an IPI with the interprofessional team concurrently with their primary PI as a dental hygienist (12,23). The presence and development of an IPI is a better assessment of preparedness of DH students to work within IP teams in non-traditional settings and meet the complex healthcare demands of the future. Therefore, the purpose of this study is to investigate the effect of an interprofessional collaborative hospital rotation on DH students' IPI.

SECTION THREE

MANUSCRIPT

This manuscript will be submitted to the Journal of Dental Education.

Introduction and Literature Review

With emerging evidence that oral health is inextricably linked to general health, the typical practice setting for dental hygienists is changing (2–4). Dental hygienists working in hospital-based care teams have the potential to improve patient well-being and health outcomes while enhancing collaboration between providers (27,30–32). Successful collaboration in interprofessional (IP) teams requires dental hygienists to be prepared to work in non-traditional practice settings, collaborating with a variety of healthcare professionals (3). Interprofessional educational (IPE) experiences train students to collaborate effectively with other healthcare professions in order to prepare them for future interprofessional collaboration (IPC) in team-based care settings (7). The majority of the research investigating outcomes of IPE is focused on the attitudes toward interprofessional practice, and emerging evidence has demonstrated how a strong uni-professional identity may influence these attitudes (23,63).

An emphasis on specialization and profession-specific curricula can lead to the development of an enhanced uni-professional identity, meaning students see their profession as different and/or better than others (23,69). While it is important for students to identify with their own profession, lack of exposure to other healthcare programs can lead to “in-group” favoritism and discriminatory “out-group” bias toward students in other healthcare professions (23). These out-profession attitudes pose a problem, as strong uni-professional identities have the potential to hinder successful IPC (23,62,69). Instead of diminishing primary professional identity (PI) in IPE, experts suggest fostering the development of a dual-identity, or interprofessional identity (IPI) (1,12,23,70).

Developing an IPI allows students to expand their “in-group” perspective to one that includes the interprofessional team, reducing distrust and “out-group” bias of other healthcare professions (75). With IPE fostering the development of an IPI, students can learn to collaborate effectively on IP teams, while not compromising their primary PI (75)

The Extended Professional Identity Theory (EPIT) defines IPI as a social identity superior to, and extended from, the professional identity, consisting of three interrelated characteristics: IP belonging, IP commitment, and IP beliefs (Figure 1) (26).

Interprofessional belonging “reflects a simple recognition of membership in a social category”, whereas commitment “reflects an individual’s perception of the intensity of their connection” to a social identity or category (50, p 4). While belonging and commitment can be generalized to a variety of professions, beliefs are particular to the situation and profession; they consist “of evaluations of what is good, legitimate, and appropriate” in the context of one’s professional group (50). In order to encourage effective collaboration, IPE must create an environment that facilitates IPI development, encouraging students to expand their primary PI into one that includes the interprofessional team (3,23,76). Measuring IPI allows educators to investigate the effectiveness of IPE interventions, factors associated with IPI formation, and can be used as a self-reflection educational tool (1).

The University of Minnesota’s (UMN) Division of Dental Hygiene has recognized the importance of incorporating IPE with the newest rotation at the UMN Medical Center. Here, dental hygiene (DH) students collaborate with medical students and residents in pre-round meetings, participate in inpatient general medicine rounds,

perform oral assessments and develop collaborative, individualized oral care plans for hospitalized patients. An educational objective of this rotation is for students to recognize the role of a DH in an IP team-based care setting and learn to collaborate effectively within the IP team. Because a uni-professional identity can hinder effective IPC, it is important that IPE interventions facilitate IPI development in order to meet these educational objectives. Therefore, the primary aim of this study is to assess IPI of senior DH students before and after the IPE hospital rotation as measured by EPIS. It was hypothesized that the IPE hospital rotation will have a positive effect on DH students' IPI.

Methods and Materials

The UMN Institutional Review Board deemed this study exempt from review, due to the study posing minimal risk to participants and consisting of normal educational practices. A pretest-posttest survey design was implemented to measure changes in IPI before and after the hospital rotation using the Extended Professional Identity Scale (EPIS) (1). The study was conducted at the UMN School of Dentistry from September 2020 to December 2020. A convenience sample of UMN senior DH and dual-degree dental therapy/hygiene (DT) students (n=28). Students participated in the hospital rotation as an embedded, required component of a core DH course. Because this hospital rotation is a component specific to the DH curricula, DT students are regarded as DH students for the purpose of this study.

Study Procedures

Embedded into the DH curricula is an established, required IPE experience collaborating with medical students at the UMN Medical Center. The student investigator

introduced the study, reviewed the purpose, risks and benefits, and invited the DH class of 2021 to participate in the study. The informed consent, pretest and posttest EPIS forms were uploaded to the Qualtrics^{XM} database, and sent to the students via a secure email (77). Eligibility was determined by the course roster, rotation schedule, and an eligibility screening question. Demographic data including age, gender, and discipline in school were also collected.

Participants were asked to complete the pretest questionnaire during the first week of the Fall 2020 semester, before rotations in the hospital began. In the second week, groups of four students rotated in the hospital for one week of four half-day sessions. During this time, students participated in pre-round meetings with attending physicians, medical residents, and third year medical students, where they collaboratively discussed the patients on their team. Students then rounded to see patients with the medical team, where they demonstrated and educated the team on how to deliver bedside oral assessments, and collaboratively developed oral care plans.

Students were encouraged to complete the EPIS posttest within 24 hours of their last day at the hospital. Surveys were matched by participant and given a random participant ID for analysis of paired data. All data was stored in Qualtrics^{XM}, and shared through Box with the principal investigator and statistician. Pretest/posttest scores were then compared and triangulated with qualitative data.

Instrument

The Extended Professional Identity Survey (EPIS), which demonstrates high reliability and construct validity, was utilized to answer the question “how does an interprofessional hospital rotation affect dental hygiene students’ interprofessional

identity”(1). Unlike other scales utilized in IPE research, the EPIS measures all three interrelated characteristics of IPI: IP belonging, IP commitment and IP beliefs (23,24,72–74). Open-ended, qualitative prompts were added to the posttest questionnaire to add depth to the data. Pilot-testing was performed on the qualitative questions to ensure clarity and validity.

Statistical Analysis

Descriptive statistics were generated for participant characteristics. Questions from the 12 item EPIS are on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The primary outcome, overall sum of the 12 items, was calculated and summarized using mean, standard deviation, median, and range. This score was used to compare pre-and post-surveys using a non-parametric Wilcoxon signed-rank test for paired data. The dependent variable, IPI, was measured by the change in total score from three categories: interprofessional belonging, commitment, and beliefs (1).

The primary outcome determined if the hypothesis, “an interprofessional hospital rotation will enhance senior DH students’ IPI”, was supported or rejected. A positive change from pre-test to post-test in the total score is positively associated with an enhanced IPI. Secondary outcomes, the 3 sub-scores for interprofessional belonging, interprofessional commitment, and interprofessional beliefs, were calculated, summarized and compared between pre- and post-surveys similar to the primary outcome. The pre-post change in total scores and sub-scores were compared between the two degree classifications (DH and DT) using the two-sample non-parametric Wilcoxon rank sum test. All reported p-values were two-sided and a significance level of 0.05 was used. Statistical analyses were performed using SAS version 9.4. Qualitative data from the

open-ended comments on the posttest EPIS forms was manually coded by the student investigator and triangulated with the qualitative data from the pretest-posttest scores.

Results

A total of 28 students were invited to participate in the study. Of the 28 respondents, three were excluded from final analysis. Two students did not participate in the hospital rotation, and one student submitted a partially complete survey. The final response rate was 89% (n=25): 18 DH students and 7 DT students. Of the sample, 92% (n=23) identified as female and 8% (n=2) male. 64% (n=16) were Caucasian, 24% (n=6) Asian, 8% (n=2) Hispanic, and 4% (n=1) Black.

The means and standard deviations (SD) were analyzed across time points for *interprofessional identity* as measured by the EPIS. The maximum score for the EPIS was 60 points, with 20 points assigned to each of the three interrelated categories of IPI. Pretest data revealed a total EPIS mean score of 53.7 (53.7±5.3). There were no statistically significant differences between DH and DT students in total IPI or any of the three interrelated subcategories (Table 2). The IPI subcategory with the highest mean score at baseline was interprofessional beliefs (18.8±1.4). Interprofessional commitment had the lowest mean score at pretest baseline (16.9±2.4).

Table 1 shows changes in students' IPI as measured by interprofessional belonging, commitment, and beliefs, showing the means, standard deviations (SD), and p-values for pre-, post- and change (post-pre) scores. Despite students demonstrating a high EPIS mean score at baseline, statistically significant ($p \leq 0.005$) positive changes were found between summated pretest and posttest mean scores for total EPIS (2.0±4.7, $p=0.021$), IP belonging (1.2±1.6, $p=0.002$), and IP commitment (0.6±2.2, $p=0.043$). IP

beliefs demonstrated a positive change in mean scores from pretest to posttest (0.2 ± 1.9), but did not reach a level of statistical significance ($p=0.540$). The greatest change in mean score from pretest to posttest was demonstrated in the subcategory of IP belonging. (1.2 ± 1.6 , $p=0.002$).

Qualitative Data

Thematic analysis of comments on the posttest were used to add depth to the research question of “how does an interprofessional hospital rotation affect senior dental hygiene students’ IPI”. After each subcategory of the EPIS, students were asked an open-ended question: “what influences your sense of belonging on interprofessional teams?”, “what influences your sense of commitment to interprofessional teams?”, and “what influences your beliefs about interprofessional teams?”. Three main themes were uncovered: *Knowledge and Experience as a Facilitator*, *Respect from Team Members*, and *Inclusive Behavior*.

Knowledge and Experience as Facilitators

Knowledge and experience as facilitators to the developing characteristics of IPI was the first major theme to emerge from the responses. Knowing the importance of interprofessional teams, particularly for the purpose of optimal patient-centered care, was a major factor influencing students’ IP beliefs and sense of belonging to the IP team:

“Going through the hospital rotation, I gained insight into the importance of interprofessional teamwork to support a patient’s wellbeing [...]” (Figure 2).

Past experiences or knowledge of IP teams were frequently discussed as impacting students’ sense of IP belonging: *“I think my sense of belonging is influenced by positive experiences I have had in interprofessional settings”* (Figure 2). Similarly,

participation in the hospital rotation proved to be a strong influencer on participants' beliefs about IP teams: *"This rotation helped me see how DH can work in an interprofessional team"* (Figure 2). Just as past experience in IP teams helped influence students' sense of IP belonging and beliefs, one response suggested a *lack of exposure* to IP teams can lead students to forget they exist: *"I think not seeing many interprofessional teams have made me forget they can exist"*.

Respect from Team Members

Respect from team members was a recurring theme for IP belonging and commitment. Respondents felt a greater sense of belonging to IP teams when the other healthcare professionals respected their input and contributions to the case: *"[IP belonging is influenced] when others ask and respect my input, [and there is] collaboration of every member of the team"*. Students expressed a greater sense of commitment when medical team members showed they valued the knowledge DH students brought to the team, and acknowledged each team member served an important role (Figure 2). Comments related to team respect were closely tied to discussions of inclusive behaviors and team communication.

Inclusive Behavior

Responses demonstrated evidence of inclusive behavior influencing the interrelated characteristics of IPI. Inclusive behaviors from team members proved to be a major contributor to DH students' sense of belonging on an IP team: *"the ability to speak at a huddle"*, *"having people from other professions ask about my role, opinions, or advice on a patient case"* (Figure 2). One student discussed how their sense of belonging depended on how "open" the other professionals were to including DH students in

discussions. One student implied their sense of belonging on IP teams can be hindered by *exclusive* communication, resulting in feeling like they're not welcome on the team:

"Sense of belonging comes from inclusion. If I am included sincerely by the teams, then I feel like I belong there and I'm not intruding".

Inclusive communication and support of a collaborative approach also influenced commitment to IP teams. Responses implied inclusive behaviors create a comfortable space for DH students, positively impacting their commitment to IP teams: *"Feeling respected and comfortable"* (Figure 2). From this inclusion and sense of community also results in a feeling of trust on the IP team, which proved important for commitment to IP teams: *"you need to be able to trust the other practitioners in your team to be able to work together efficiently [...]"*.

Summary of Qualitative Data

Generally, students discussed how this rotation highlighted the importance of interprofessional collaboration, and brought to light the disconnect between the medical and dental communities: *"There is a systemic and oral connection that can greatly impact these patients, and often it does not get looked at", "[...] in medicine they don't focus a lot on the importance of oral [hygiene] and how it can affect overall body", "[...] Oral health is very often shrugged off, but it is something everyone should be aware of and educated on"* (Figure 2). Finally, the interrelated characteristics of IPI were positively influenced when DH students felt their knowledge of the oral/systemic link was applicable and important to the medical team and patient care.

Discussion

There is sufficient evidence to suggest that the interprofessional hospital rotation positively impacted senior DH students' interprofessional identity. Results of this study revealed the students began the hospital rotation with a high baseline EPIS score, indicating a partially formed IPI. Despite this high baseline score, the hospital rotation resulted in a statistically significant increase in students' overall IPI, suggesting IPE should be implemented at various timepoints throughout professional education to promote continual IPI development with the concurrently developing primary PI (13,40).

The positive total change in IPI posit the timing of the hospital rotation within the students' curriculum is appropriate and aligns with the interprofessional socialization framework (IPSF) proposed by Khalili et al. (23). The authors suggest a stepwise framework to support the development of an IPI (23). Stages 1 and 2 of this framework focus on breaking down barriers to IPC, such as negative stereotypes, and interprofessional role learning (23). Stage 3 consists of implementing IPE with a focus on dual identity, or IPI, development (23). It can be theorized that the statistically significant positive change in IPI from pretest to posttest is due in part to the timing of the hospital rotation taking place during the students' senior year; students have progressed through the first stages of the IPSF earlier in their curriculum with case-based, didactic IPE. The experiential nature of this IPE facilitated IPI development by allowing students a real-life experience practicing as a member on the hospital team. Functioning as a contributing member on the IP team led to a greater sense of belonging, which may facilitate IP commitments and beliefs.

At baseline, IP beliefs was the highest scoring subcategory of IPI. The high baseline score suggests students at this point in their professional education are already

aware of the importance of IPE and working within IP teams. A likely contributor to this finding is students' participation in the UMN IHealth IPE progressive framework: Phase I: orientation; Phase II: Necessary Skills; Phase III: Expertise in Practice. At this timepoint, students have participated in phase I and phase II modules, both of which involved collaboration with other healthcare students. Further, during the hospital rotation, students are enrolled in a didactic course which focuses on the oral/systemic connection, identification, and management of oral/systemic conditions. Research supports past experiences in profession-specific settings are major contributing factors to PI development (33,53,56). A 2020 study by Khalili et al., found past experience in IPE did not contribute to dual identity development directly, but was an essential component to the interprofessional socialization process (65). Before engaging in the hospital rotation, DH students in this study have only participated in case-based or didactic IPE, and have not performed profession-specific tasks within an IP team. This could be a reason for low baseline commitment to IP teams.

Students began the hospital rotation with IP commitment being the least developed subcategory of IPI. Interprofessional commitment “reflects an individual’s perception of the intensity of their connection” to a social identity or category, in this case, the IP team (50, p4), and is an essential component of ingroup identification (1,23,26,71). Reasons for lower baseline IP commitment may be due to learning primarily in a profession-specific silo. Khalili et al., posit that this profession-specific learning environment contributes to an isolationist “in-group” identity, or a uni-professional identity (23). Though students have had case-based IPE, their primary clinical experiences have been in traditional dental settings, absent of members from

other healthcare professions. Additionally, the COVID-19 pandemic resulted in students transitioning to a completely online or hybrid learning environment, severely reducing the amount of contact students had with other healthcare students on campus. While students have learned the concept of IPC in their careers, the idea may be too abstract for them to categorize IP team as part of their “in-group” identity. Prior to the hospital rotation, students may not have been able to conceptualize working in IP teams because of the lack of “real-world” experience in non-traditional settings where this type of IPC occurs.

The hospital rotation was successful in fostering commitment to IP teams. A reason for this positive change can be attributed to the experiential nature of the IPE. This rotation is unique to any IPE DH students have had in their curricula so far. Students enter the rotation with a conceptual knowledge of IPC based on hypothetical case-studies, but have not yet put theory into practice. The hospital rotation allows for practical application of didactic knowledge in an IP setting, with students performing profession specific tasks within the larger IP care team. The hospital rotation allowed for experiential opportunities to think, act, and feel what it would be like to work within an IP team. This rotation challenged students to expand their “in-group” to one that includes their role within an IP team, increasing IP commitment.

Although IP belonging was partially formed at baseline, it had the greatest positive change from pretest to posttest. Qualitative responses revealed hands-on experience and inclusion were major contributing factors sense of belonging on an IP team (Figure 2). This is important, as it shows this hospital rotation allows for students to see where they fit into interprofessional teams, increasing their sense of belonging to such

teams. The hospital DH served as a role-model, allowing the idea of collaboration in non-traditional practice settings to become tangible. Fried et al., called for faculty to serve as effective role models in order to prepare dental hygiene students to work interprofessionally within non-traditional practice settings (3). This aligns with past literature citing role models as a key component in PI development (14–18,55). It can be theorized that profession-specific role models within IP teams are an important factor for DH students' IPI development.

Finally, recent research suggests successful IPE should not diminish primary PI to promote successful collaboration, but rather foster the development of a dual identity, or an IPI, concurrent with the developing PI (1,63,65,78). The hospital rotation was successful in developing IPI for this reason. This rotation provided students with an experiential opportunity to see where they fit into the IP care team, without changing or diminishing primary PI. This was partly due to the hospital dental hygienist who served as an example of the role of dental hygiene on the hospital care team. The unique qualities of the hospital rotation helped positively influence the three interrelated characteristics of IPI, leading to a positive total change in IPI after the hospital rotation.

Limitations

This study had several limitations that should be considered in the discussion of the results. First, this was a short-term study with no control group. In addition, the small number of participants reduces the generalizability of the study findings to other DH institutions. Further, medical students within the IP team were not included in the study. To gain full insight into successful IPC, it is essential to understand all team members' perspectives of IPE, and whether other team members' IPI changed following the

experience. Finally, though the change in IPI was statistically significant, the practical application of this positive change requires further investigation.

Conclusions

Senior DH students' IPI was measured before and after participation in an interprofessional hospital rotation. Results from this study revealed a positive change in IPI, with two of the three interrelated characteristics, IP belonging and IP commitment, increasing to a point of statistical significance. Past knowledge, respect from medical team members, and inclusive behaviors were cited as important factors in strengthening overall sense of IPI. The experiential nature and unique qualities of the IPE allowed for students to expand their "in-group" more to one that includes the IP team. Application of these results can help inform future design and implementation of IPE to facilitate IPI development.

SECTION 4

TABLES AND FIGURES:

Table I:

Comparing pre and post questionnaires

Scores	Mean (SD)	Median [min/max]	P-value*
Total EPIS score			
Total, Pre	53.7 (5.3)	56.0 [45/60]	
Total, Post	55.7 (4.1)	57.0 [45/60]	
Total, Post-Pre†	2.0 (4.7)	2.0 [-10/11]	0.021
Interprofessional belonging			
Belonging, Pre	18.0 (2.0)	19.0 [14/20]	
Belonging, Post	19.2 (1.4)	20.0 [15/20]	
Belonging, Post-Pre†	1.2 (1.6)	1.0 [-2/4]	0.002
Interprofessional commitment			
Commitment, Pre	16.9 (2.4)	17.0 [13/20]	
Commitment, Post	17.4 (2.3)	18.0 [13/20]	
Commitment, Post-Pre†	0.6 (2.2)	1.0 [-7/4]	0.043
Interprofessional Beliefs			
Beliefs, Pre	18.8 (1.4)	20.0 [16/20]	
Beliefs, Post	19.1 (1.5)	20.0 [16/20]	
Beliefs, Post-Pre†	0.2 (1.9)	0.0 [-3/4]	0.540

* The p-value is derived from the non-parametric Wilcoxon signed rank test to compare the pre to post changes.

† A positive number indicates an increase in the score from pre to post.

Table II: Comparing pre and post differences between dental hygiene degrees (N=25)

Scores	Mean (SD)	Median [min/max]	P-value*
Total EPIS score. Post - Pre†			
DH (n=18)	1.8 (4.5)	2.0 [-10/10]	0.808
DT (n=7)	2.6 (5.4)	3.0 [-5/11]	
Interprofessional belonging. Post - Pre†			
DH (n=18)	0.8 (1.5)	0.5 [-2/4]	0.076
DT (n=7)	2.1 (1.6)	2.0 [0/4]	
Interprofessional commitment. Post - Pre†			
DH (n=18)	0.6 (2.2)	1.0 [-7/4]	1.00
DT (n=7)	0.6 (2.4)	1.0 [-4/4]	
Interprofessional Beliefs. Post - Pre†			
DH (n=18)	0.4 (1.8)	0.0 [-3/4]	0.466
DT (n=7)	-0.1 (2.1)	0.0 [-3/3]	

* The p-value is derived from the non-parametric Wilcoxon rank sum test to compare the pre to post change between groups.

† A positive number indicates an increase in the score from pre to post.

Figure 1: Interprofessional identity as a superordinate social identity of professional identity with three interrelated characteristics (1)



Figure 2: Qualitative Themes:

Themes	Sub Themes	Quotes
<u>Knowledge Experience as Facilitators</u>	IP Belonging	<p><i>"[...] my sense of belonging is influenced by positive experiences I have had in interprofessional settings"</i></p> <p><i>"Knowledge I think influences my sense of belonging on an interprofessional team.</i></p> <p><i>[...] Knowing the link between oral and systemic health, for example, influences my sense of belonging"</i></p>
	IP Beliefs	<p><i>"Experience is a strong influencer as well as knowledge on the importance of interprofessional teams"</i></p> <p><i>"This rotation helped me see how DH can work in an interprofessional team"</i></p> <p><i>"I think not seeing many interprofessional teams made me forget they can exist"</i></p> <p><i>"My beliefs about interprofessional team is influenced by past experiences"</i></p>
<u>Respect from Team Members:</u>	IP Belonging	<p><i>"[IP belonging is influenced] when others ask and respect my input, [and there is] collaboration of every member of the team".</i></p> <p><i>"Communication, respect, and trust".</i></p> <p><i>"When others ask and respect my input".</i></p>
	IP Commitment	<p><i>If I feel like my contributions are appreciated and I can see a difference for the patient, I feel a stronger sense of commitment to IP teams"</i></p> <p><i>"I think it's important for members to understand the role of each professional and respect their knowledge and skills"</i></p> <p><i>"It is important for all health professionals to understand the connection of oral health to overall health"</i></p>

		<p><i>"[IP commitment] all depends on the amount of respect everyone has for each other".</i></p>
<p><u>Inclusive Behavior</u></p>	<p>IP Belonging</p>	<p><i>"the ability to speak at a huddle",</i></p> <p><i>"asking [our] thoughts"</i></p> <p><i>"The medical team always introduced us and offered the oral screening at every visit"</i></p> <p><i>"having people from other professions ask about my role, opinions, or advice on a patient case".</i></p>
	<p>IP Commitment</p>	<p><i>"[...]the effort and drive from the team make it successful",</i></p> <p><i>"that [they're] trying to understand others' perspective, and learning from others",</i></p> <p><i>"the strive to give the patient the best comprehensive care possible"</i></p>

SECTION 5

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SECTION 6

Appendix A: Practical Applications

With growing evidence linking oral health to systemic health, dental hygiene institutions are recognizing the need to prepare students to collaborate efficiently on multidisciplinary health care teams (1–4). Recent research suggests interprofessional educational (IPE) experiences should focus on facilitating the development of an interprofessional identity (IPI) as a predictor of positive outcomes on interprofessional teams, instead of diminishing primary professional identity (PI) (22). Therefore, efforts to develop IPE that facilitates IPI development is indicated in order to prepare dental hygienists for collaborative practice in non-traditional practice settings.

According to the Extended Professional Identity Theory (EPIT), IPI is a social identity consisting of three interrelated characteristics: interprofessional commitment, belonging, and beliefs (26). This theory guided the development of the Extended Professional Identity Scale (EPIS), which was used in this study to measure IPI of senior dental hygiene students before and after an interprofessional hospital rotation. The results of this study indicate experiential IPE in a non-traditional practice setting contributed to an increased IPI of senior dental hygiene students. The rich qualitative data strengthens these findings and provide additional insight into the design and implementation of future IPE to support IPI development. More research is needed to determine IPI of other team members, and the sustainability of IPI after graduation.

Appendix B: IRB Exemption Letter:

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Human Research Protection Program
Office of the Vice President for Research

Room 350-2
McNamara Alumni Center
200 Oak Street S.E.
Minneapolis, MN 55455
612-626-5654
irb@umn.edu
<https://research.umn.edu/units/irb>

EXEMPTION DETERMINATION

May 20, 2020

Cyndee Stull

651-324-9099
stul0045@umn.edu

Dear Cyndee Stull:

On 5/20/2020, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	The Effect of an Interprofessional Collaborative Hospital Rotation on Dental Hygiene and Dual Degree Dental Therapy Students' Interprofessional Professional Identity
Investigator:	Cyndee Stull
IRB ID:	STUDY00009679
Sponsored Funding:	None
Grant ID/Con Number:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	<ul style="list-style-type: none">• 857, Category: Consent Form;• Modified EPIS Instrument, Category: Other;• Flavin Vers 2 IRB, Category: IRB Protocol;

IMPORTANT: All human research conducted at the University of Minnesota must adhere to the [Latest IRB Guidance and FAQs](#), [Office of the Vice President for](#)

Driven to DiscoverSM

[Research guidance](#), and [MHealth Fairview and Medical School guidance \(if applicable\)](#) in response to the COVID-19 pandemic. While the IRB continues to review and approve research, the guidance takes precedence, meaning that some research activities, including enrollment of participants, may not take place at this time for certain types of research. All researchers should review the guidance often as it is updated frequently by the Human Research Protection Program.

The IRB determined that this study meets the criteria for exemption from IRB review. To arrive at this determination, the IRB used "WORKSHEET: Exemption (HRP-312)." If you have any questions about this determination, please review that Worksheet in the [HRPP Toolkit Library](#) and contact the IRB office if needed.

The PI confirmed that this research may not begin until UMN and DDS department allows classes to start and the UMN COVID-19 guidelines to researchers are been revised.

This study met the following category for exemption:

- (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices. (Both the procedures involve normal education practices and the objectives of the research involve normal educational practices)

Ongoing IRB review and approval for this study is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a Modification to the IRB for a determination.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the [HRPP Toolkit Library](#) on the IRB website.

For grant certification purposes, you will need these dates and the Assurance of Compliance number which is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003).

Sincerely,

Cynthia McGill CIP
IRB Analyst

We strive to provide clear, consistent and timely service to maintain a culture of respect, beneficence and justice in research. [Complete a brief survey](#) about your experience.

Appendix C: Pretest Invitation Email

Hi all!

Please follow the link below to take the short **pre-test survey** for the Hospital Rotation you will be completing this semester. When it asks if you are scheduled to rotate to the hospital this semester please select **yes**, unless you have been told otherwise.

If you have any questions please feel free to reach out to me by email.

Your participation in this survey is greatly appreciated and highly valued!

Thank you!

Follow this link to the Survey:

[\\${1://SurveyLink?d=Take the Survey}](#)

Or copy and paste the URL below into your internet browser:

[\\${1://SurveyURL}](#)

Follow the link to opt out of future emails:

[\\${1://OptOutLink?d=Click here to unsubscribe}](#)

Appendix D: Informed Consent:
INFORMATION SHEET FOR RESEARCH

"The Effect of an Interprofessional Collaborative Hospital Rotation on Dental Hygiene and Dual Degree Dental Therapy Students' Interprofessional Identity"

You are invited to be in a research study of the interprofessional collaborative hospital rotation's effect on your interprofessional identity. You were selected as a possible participant because the hospital rotation is an embedded, required component of the dental hygiene process of care course, DH3234W, and we wish to explore whether the educational objectives are being met. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Keeley Flavin, LDH and Cyndee Stull, MDH of the division of dental hygiene at the University of Minnesota.

Procedures:

If you agree to be in this study, we would ask you to do the following things: Complete a pretest and post-test questionnaire before and after your participation in the hospital rotation. You will be asked to complete these questionnaires by a specific due date.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or your grade in DH3234W.

Contacts and Questions:

The researcher(s) conducting this study is (are): Keeley Flavin and Cyndee Stull. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact them at Student investigator: flavi027@umn.edu, 952-457-0457.

Advisor and principal investigator:
Cyndee Stull, 612-626-3412, stul0045@umn.edu,
University of Minnesota School of Dentistry
8-536 Moos Tower
515 Delaware St SE
Minneapolis, MN 55455

This research has been reviewed and approved by an IRB within the Human Research Protections Program (HRPP). To share feedback privately with the HRPP about your research experience, call the Research Participants' Advocate Line at 612-625-1650 (Toll Free: 1-888-224-8636) or go to z.umn.edu/participants. You are encouraged to contact the HRPP if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

You will be given a copy of this information to keep for your records.

Appendix E: Pretest Survey:

Q1 Are you scheduled to rotate to the hospital for the Fall 2020 semester?

- Yes (1)
- No (2)

Skip To: End of Survey If Are you scheduled to rotate to the hospital for the Fall 2020 semester? = No

End of Block: Eligibility Question

Start of Block: Demographic Questions

Q2 What dental program are you enrolled in?

- Bachelor of Science in Dental Hygiene (BSDH) (1)
- Dual Degree Dental Therapy/Dental Hygiene (DT) (2)

Q3 What gender do you identify as?

- Male (1)
- Female (2)
- Other (3)
- Prefer not to answer (4)

Q4 What race do you identify as?

- Asian (1)
- Black (2)
- Pacific Islander (3)
- American Indian/First Nations (4)
- Caucasian/White (5)
- Hispanic (6)
- Mixed race (7)
- Other (8)
- Prefer not to answer (9)

End of Block: Demographic Questions

Start of Block: Block 6

This survey will ask you to rate your agreement to a series of statements about working with other healthcare professionals during interprofessional educational (IPE) experiences.

With this questionnaire, give your personal opinion regarding *interprofessional collaboration* as a future professional. There are no right or wrong answers.

Interprofessional collaboration happens when individuals from different professions come together and complement each other in order to create one care pathway for each (complex) patient.

End of Block: Block 6

Start of Block: Interprofessional Belonging

Q5 I like meeting and getting to know people from other health professions.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q6 I feel a strong attachment towards interprofessional teams comprising of cross-disciplinary professions.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q7 I like learning about other health professions.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q8 I enjoy learning from and collaborating with people from other health professions.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

End of Block: Interprofessional Belonging

Start of Block: Interprofessional Commitment

Q9 I would be very happy to spend the rest of my career with an interprofessional team.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q10 I prefer working with others in an interprofessional team.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q11 I identify myself with other members of an interprofessional team.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q12 I am proud to be part of an interprofessional team.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

End of Block: Interprofessional Commitment

Start of Block: Interprofessional Beliefs

Q13 Joint clinical decision making should be an important part of interprofessional collaboration.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q14 All members of an interprofessional team should be involved in goal setting for each patient.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q15 Interprofessional team members should jointly agree on the planning for patient care.

- Strongly agree
 - Somewhat agree
 - Neither agree nor disagree
 - Somewhat disagree
 - Strongly disagree
-

Q16 When care decisions are made, the interprofessional team members should strive for consensus on planned processes.

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

End of Block: Interprofessional Beliefs

Appendix F: Modified Post-test Survey

Additional qualitative questions:

What influences your sense of interprofessional belonging? Please use the space provided to expand on your personal sense of interprofessional belonging.

What influences your sense of commitment to interprofessional teams? Please use this space to expand on your personal sense of interprofessional commitment.

What influences your beliefs about interprofessional teams? Please use this space to expand on your personal interprofessional beliefs.

Please use this space to provide any additional comments you have about your professional identity as it pertains to this hospital rotation.

Appendix G: Post-test Survey Email

Hi Students,
Please fill out the posttest survey questionnaire within the **next 24 hours**.
Thank you!

Follow this link to the Survey:

[\\${1://SurveyLink?d=Take the Survey}](#)

Or copy and paste the URL below into your internet browser:

[\\${1://SurveyURL}](#)

Follow the link to opt out of future emails:

[\\${1://OptOutLink?d=Click here to unsubscribe}](#)

Appendix H: Post-test Survey Follow-up Email

Hello,

If you have not yet completed the post-test hospital rotation survey, please follow the link below to complete this survey as soon as possible. Thank you!

Follow this link to the Survey:

[\\${1://SurveyLink?d=Take the Survey}](#)

Or copy and paste the URL below into your internet browser:

[\\${1://SurveyURL}](#)

Follow the link to opt out of future emails:

[\\${1://OptOutLink?d=Click here to unsubscribe}](#)