1-2024

# An Analysis of Interprofessional Education Research Literature and Characterization of Audiology-Inclusive Studies

Gabriella Schalasky
gtscha1@ilstu.edu

Antony Joseph
*Illinois State University*, arjosep@ilstu.edu

# AN ANALYSIS OF INTERPROFESSIONAL EDUCATION RESEARCH LITERATURE AND CHARACTERIZATION OF AUDIOLOGY-INCLUSIVE STUDIES

Capstone Document

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Audiology (Au.D.)

in the Graduate School of Illinois State University

By

Gabriella T. M. Schalasky, B.S.

Illinois State University

January 2024

**Approved By:** Antony Joseph, MA, Au.D., Ph.D., ABAC, CCC-A, CPS/A, F-NAP, Advisor

## ABSTRACT

This project aimed to explore the foundational connection between Audiology and interprofessional education as reflected in published scientific reports, while also identifying the common tools utilized in audiology interprofessional education and interprofessional practice research. Through a comprehensive literature review and analysis of publications encompassing both Audiology and those without, it was observed that studies involving audiology often lacked the utilization of validated interprofessional education surveys. In contrast, publications not focused on Audiology exhibited a higher prevalence of using validated interprofessional education surveys. Within audiology-inclusive publications, two specific questionnaires emerged as frequently employed in interprofessional education research. This analysis identifies the perceived need for an enhanced integration of interprofessional training, assessment tools, and research within the field of Audiology.

## ACKNOWLEDGMENTS

I would like to express my sincere thank you to my family for their unending love and support during this journey. The constant encouragement and reassurance compelled me to continue to work hard at all that I do. I would also like to thank my mentor, Dr. Joseph, for recognizing my potential and supporting my educational and professional journey in the field of Audiology.

# VITA

Gabriella T.M. Schalasky

## EDUCATION

| Institution | Degree/Date | Field of Study |
|---|---|---|
| Illinois State University | Expected Au.D./2024 | Audiology |
| Illinois State University | B.S./2020 | CSD |

## EXPERIENCE

**Graduate Research Assistant**, Department of Health Sciences at Illinois State, 2021-2023

**Graduate Research Assistant**, Department of Audiology at Illinois State, 2020-2021

**Undergraduate Lab Assistant,** Hearing Loss Prevention Lab, 2019-2020

**Coordinator,** Senior Screening Service (S-3), 2021-2022

**Treasurer,** Illinois State Student Academy of Audiology, 2022-2023

**Member,** Illinois State and National Student Academy of Audiology, 2019-2023

# TABLE OF CONTENTS

# CHAPTER 1

## INTRODUCTION

Established around the time of World War II, Audiology has provided allied health care for individuals with hearing difficulties, balance problems, tinnitus, and various auditory conditions. Audiologists deliver their services in diverse clinical settings, including hospitals, clinics, private practices, and educational settings. When providing care, audiologists often collaborate with other health professionals, commonly classified as interprofessional practice (IPP). In both medical and educational contexts, IPP has been recognized as a crucial method for delivering personalized healthcare. Efficient IPP implementation occurs when professionals from diverse disciplines unite to provide high-quality patient care (WHO, 2010). Interprofessional practice is an approach to diagnostic and rehabilitative care designed to enhance successful collaboration among healthcare professionals from diverse backgrounds with a primary objective of enhancing outcomes for individuals receiving services within the healthcare system.

To prepare medical and health science students for IPP, programs have introduced various interprofessional education (IPE) training initiatives. These programs enable students with activities, simulations, and educational panels to enhance their knowledge, abilities, and leadership skills for imminent IPP opportunities. Nevertheless, audiology has not played a prominent role in interprofessional programming or research. While nursing, social work, medicine, pharmacy, and physical therapy have demonstrated significant benefits for patient outcomes through IPE, potential contributions to clinical and training teams remain underutilized by audiology. Engaging audiology academic programs in IPE initiatives could unlock valuable benefits for both clinical teams and training programs. However, to achieve this, it is essential to describe the foundational connection between audiology and IPE in the scientific literature.

## Interprofessional Education

### *Health Professions*

Several studies have collectively underscored the importance of technology integration, blended learning formats, effective IPE theories, and comprehensive strategies for IPP to enhance interprofessional collaboration and education in healthcare settings. Various communication technologies, including web boards and email, offer avenues for integrating technology into pre-licensure and postgraduate teachings. Carbonaro et al. (2008) proposed a blended learning format, combining online components with face-to-face interactions, to address challenges in transitioning to entirely online learning. Investigating the effectiveness of teaching interprofessional team process skills, the investigators focused on key learning outcomes such as understanding health professionals' roles, team process skills, decision-making, and a patient-centered approach. Over five weeks, nine health science programs participated in two three-hour classes per week. Facilitators assessed communication, teamwork, interprofessional relationships, learning, and interaction. While post-intervention scores demonstrated improvement, a notable difference between face-to-face and blended formats emerged for the speed of decision-making.

To identify the best framework, Clark (2006) explored various theoretical methods for comprehensively visualizing patient diagnoses. The IPE theory that emerged emphasized collaborative learning, drawing on cooperative, collaborative, or social learning, experiential learning, epistemology and ontology of interdisciplinary inquiry, cognitive and ethical student development, and educating the reflective practitioner. Furthermore, D'Eon (2005) suggested approaches including cooperative learning, skill mastery, and best practices to enhance IPE. Evidence-based teaching, clear expectations, and scaffolding learning on prior knowledge

reportedly contribute to successful IPE, facilitating knowledge transfer to clinical practice and boosting student confidence and their ability to engage in interprofessional collaboration (IPC). To assist stakeholders with the development of strategies to promote IPE and IPC in healthcare systems, Gilbert et al. (2010) presented a World Health Organization (WHO) procedural outline. Their mechanisms for IPE development included staff training, institutional support, logistics, scheduling, and shared objectives, aiming to integrate health workforce planning and policy-making to fully support IPE and collaboration. Understanding the unique culture of each profession, its values, and its educational requirements is crucial for overcoming communication barriers and promoting trust and respect in IPC (Hall, 2005). In addition, the development of culture within healthcare professions and the challenges it might pose to effective interprofessional teamwork have been investigated (Hall, 2005). For example, Wellmon et al. (2012) described the importance of integrating interprofessional learning into pre-licensure curricula. To develop an optimal culture, the authors advocated for collaborative problem-solving of clinical issues to foster the skills of students in advocacy, readiness for leadership roles, and resolving barriers to teamwork.

The association between interprofessional teamwork skills, that have been taught through simulations, and positive clinical outcomes has been explored, and the results suggested that healthcare simulations can improve attitudes toward IPP and teamwork, contributing to positive clinical outcomes (Shrader et al., 2013). Golom and Schreck (2017) investigated IPP and reported the benefit of collaborative approaches and competencies like teamwork, communication, ethics, and roles and responsibilities. Effective IPP requires team members to develop professional relationships and possess competencies in specified areas of IPP. For example, Klocko et al. (2012) developed a one-credit course to improve student communication

skills,  teamwork, and their understanding of health professions outside their discipline. Their course revealed substantial growth in teamwork and communication skills, emphasizing its positive impact on student communication.

A longitudinal, interprofessional, community-based mentoring experience with medical, nursing, physical therapy, and occupational therapy students was implemented to promote interprofessional competencies (Rose et al., 2009). This study identified a need for higher education to dedicate lectures to IPE and clinical experiences to heighten collaborative skills. Methods such as Grand Rounds may be employed as a delivery method for IPE because it may be effective in providing a platform for collaborative learning among students from various healthcare professions (Namazi et al., 2019). Taken together, the development of positive cultural norms, facilitation of collaborative learning experiences, and dedicated educational efforts contribute to the success of interprofessional initiatives.

### C*ommunication Sciences and Disorders*

The significance of collaboration, its associated challenges, and the steps required to support IPE and IPP were elucidated by Pickering & Embry (2013). For future professionals in communication sciences and disorders (CSD), IPE proves integral in enhancing patient outcomes and strengthening care by improving efficiency, service continuity, error reduction, and facilitating resource sharing. Despite these benefits, numerous training programs lack opportunities to cultivate such essential learning experiences. Some barriers include insufficient funding, rewarding individual achievement, and the differences among the cultures of medical and allied health professionals. Pickering & Embry (2013) offered a comprehensive ten-step framework about how to implement IPC within classrooms, clinics, and communities. Starting with "Step 1: Scan the internal and external environment to see what is available," the emphasis

is on reaching out to community organizations for broader clinical exposure to IPE. "Step 2: Find a willing colleague" encourages building relationships to increase dialogue and problem-solving. "Step 3: Identify a shared vision and tap into individual strengths" promotes the sharing of strengths and visions for collaborative projects. "Step 4: Enhance core competencies for collaboration" underscores the importance of shared competencies among team members. "Step 5: Plan carefully" highlights trust and respect as crucial components for success. "Step 6: Engage stakeholders in planning and evaluation" encourages feedback to improve the project. "Step 7: Get administrative support" emphasizes the role of administrative support in increasing partnerships. "Step 8: Seek funding and share resources" encourages generating income while improving the project. "Step 9: Share what you are doing" underscores the importance of sharing collaborative successes. "Step 10: Follow up, evaluate, improve" emphasizes continuous discussion and improvement to meet project goals.

As mentioned above, simulations can be designed for students from diverse healthcare professions to facilitate IPE experiences. Using the core competencies described by the Interprofessional Education Collaborative (IPEC, 2016), students from four programs (CSD, physical therapy, physician assistant, and dental hygiene) were engaged collaboratively in simulated cases presented by actors (Smith & Anderson, 2019). Consisting of graduate students, with CSD being the only discipline involving both graduate and undergraduate students, participants provided qualitative data through surveys before and after the simulation cases. Outcomes varied among disciplines, however, CSD students endorsed the importance of interprofessional communication and the accumulation of IPE knowledge. Smith & Anderson (2019) reported that CSD and dental hygiene students demonstrated significant improvement in post-surveys when compared to students from physical therapy and physician assistants,

however, the results may have been influenced by the educational standing of students within their undergraduate or graduate programs.

### *Clinical and Educational Audiology*

The Whole School, Whole Community, Whole Child (WSCC) model, as outlined by Heassler (2018), serves as a comprehensive framework guiding school-based audiologists toward simultaneously improving student health and academic outcomes. Recognizing the imperative for audiologists in schools to engage in interprofessional collaborative practice, professional organizations advocate for the use of the IPEC (2016) core competencies. The IPEC guidelines aim to advance collaboration among diverse health professions, promoting teamwork and efficiency in health service programs. Heassler (2018) emphasized ongoing collaboration among audiologists, speech-language pathologists, and nurses within school health programs. The exchange of knowledge and skills among these professionals proves essential for resolving problems and achieving the goals of school healthcare programs. Explicitly, educational audiologists play a critical role in ensuring students have access to effective communication in the classroom through services such as hearing screening programs, audiological evaluations and referrals, in-service training, and the dispensing and monitoring of assistive listening devices. In educational settings,  to emphasize a holistic approach, IPC should be extended beyond healthcare professionals and include teachers, families, and students.

Some studies have discussed the collaborative opportunities between audiology, nursing, and general medicine. Addressing the role of nurses in hearing health, Laubach (2010) emphasizes their importance in identifying hearing difficulties among older patients. Nurses are encouraged to conduct visual inspections of the ears and collaborate with otolaryngologists, audiologists, and primary care physicians for a comprehensive diagnosis and rehabilitation plan.

The nurse's role as the first point of contact underscores the importance of early detection and intervention in addressing changes in patients' hearing. Foster (1998) provided an anecdotal account of the role of an occupational health nurse in hearing conservation, emphasizing the critical role of collaboration between healthcare professionals in promoting hearing health in the occupational setting. Furthermore, the challenges related to the delivery of effective hearing health services to pediatric patients have been investigated. Given the pediatric audiology knowledge gap among doctors and nurses, better pediatric audiology training has been suggested to improve hearing screening accuracy, interpretation of test data, and suitability of referrals (Torkko et al., 1997). Collaborative practice opportunities with numerous medical specialists were described by Joseph et al. (2020) and the National Academies of Practice, however, the basis of these professional interactions should be incorporated into doctoral audiology IPE.

Effective interprofessional relationships may be established in a variety of work environments (Volkers, 2016). Data were collected from speech-language pathologists and audiologists on overcoming systemic failures, territoriality, and lack of familiarity with other professions, and regular meetings, clear communication, collaboration, support, and common goals emerged as important aspects of optimizing relationships. In addition, Pecukonis et al. (2008) addressed the challenges of delivering IPE and proposed approaches to overcome these barriers. The authors identified obstacles such as profession-centrism and resource constraints and encouraged the use of multi- and inter-disciplinary teams. Focusing on *interaction*, *data collection*, *expertise sharing*, and *attention to other professions*, was a suggestion for the promotion of IPC cultural competence for healthcare teams (Pecukonis et al., 2008). Similarly, Pien et al. (2018) study modeled the successful redesign of a program to create an IPP culture, including health science students from various disciplines in a series of workshops aimed at

improving teaching skills, curriculum development, and interprofessional collaboration. The authors discovered that healthcare professionals can enhance their knowledge, skills, attitudes, and behaviors as educators through workshops and intensive courses, demonstrating that IPE can be integrated into the development of future health science educators (Pien et al., 2018).

Smith & Anderson (2019) paired students from audiology and physician assistant programs to enhance their understanding of each other's roles and responsibilities. The results highlighted the importance of interprofessional training for both groups and reinforced the role of collaborative efforts in the provision of optimal patient care. Care for vestibular disorders may also be improved by IPC. A study by Trommelen et al. (2014) demonstrated that collaboration between audiology and physical therapy students resulted in increased knowledge, communication, and referrals, which enhanced their understanding of complex balance disorders. Similarly, Lairamore et al. (2013) provided forum-based IPE for nursing, nutrition, speech-language pathology, and occupational therapy students, and discovered improved competence in communication and teamwork as intervention outcomes.

The importance of IPE and teams that included physicians, nurses, audiologists, and pharmacists was reported by Mogole et al. (2019) regarding the management of patients prescribed ototoxic treatments, especially using IPC for ototoxic monitoring to improve patient outcomes. When applying simulation-based IPE for nursing, speech-language pathology, and audiology students, VandeWaa et al. (2019) discovered that IPE improved knowledge of medication toxicity that impacts communication, swallowing, and balance while enhancing their understanding of individual roles and responsibilities. Page et al. (2021) employed organizational theory to examine an IPE experience that included nursing, athletic training, dietetics, occupational therapy, and speech-language pathology students. Although students were doubtful

initially, the resulting data revealed an improved understanding of their discipline, as well as the professions of other students (Page et al., 2021). In another study, dental hygiene students demonstrated improved communication, understanding of referrals, and patient care quality following an IPE intervention (Brame et al., 2019), which was conducted in collaboration with audiology students.

In summary, these studies collectively highlight the critical role of IPE in enhancing collaboration, communication, and patient outcomes across numerous healthcare professions. The identified challenges, such as profession-centrism and resource constraints, highlight the ongoing need to integrate IPE into health science and patient care curricula. The findings contribute to the growing body of evidence supporting the value of IPE in preparing future healthcare professionals for IPC.

# CHAPTER 2

# LITERATURE ANALYSIS

Two groups were formed from the experimental publications that were examined: articles that included audiology and articles that did not include audiology (comprised of other health sciences). The published scientific articles that included audiology in the sampling were Brame, J, et al. (2019), Eaton, B. & Regan, S. (2015), Frost, J., et al. (2019), James, J., et al. (2017), Jernigan, S., et al. (2016), Lazar, A., et al. (2015), Mogole, O., et al. (2019), Pien, L., et al. (2018), Torkko, E., et al. (1997), Trommelen, R., et al. (2014), VandeWaa, E., et al. (2019), and Volkers, N. (2016). The scientific publications that did not include audiology were Carbonaro, M., et al. (2008), Funk, A., et al. (2018), Hendershot, C., et al. (2011), Jones, A. & Jones, D. (2011), Lairamore, C., et al. (2013), Klocko, D., et al. (2012), Namazi, M., et al. (2019), Page, C., et al. (2021), Pechak, C., et al. (2018), Rose et al. (2009), Shrader, S., et al. (2013), Smith, B., & Anderson, K. (2019), and Wellmon, R., et al. (2017).

## *Sample Size*

The total number of published experimental interprofessional and audiology papers was 25 articles, which included a total of 5,031 subjects, or 201 subjects per article. The total range of samplings for the publications was 6 to 944 subjects. The sample size for articles that included *Audiology* (n = 12, 48%) was compared to publications comprised of *Other Health Sciences* (n = 13, 52%). The total count of subjects in *Audiology* articles was 2,867 (57%), while *Other Health Sciences* had 2,164 (43%) for a total of 5,031 subjects. A study from an *Audiology* publication contained the largest number of subjects (n = 239), while the largest study from *Other Health Sciences* revealed a lower sample (n = 167).

***Subject Type***

**Figure 1** is a classification of the types of subjects across *Audiology* and *Other Health Sciences*. For the *Audiology* group, 7 (58%) of the articles sampled students and 5 (42%) of the articles recruited professionals for the study. For the *Other Health Sciences* group, 10 (77%) articles sampled students, 2 (15%) recruited professionals, 1 (8%) sampled staff members, and 1 (8%) recruited patients. The *Other Health Sciences* count is not mutually exclusive because one study sampled both students and professionals (so the total exceeds 100%). Overall, samples are most frequently students for the *Audiology* and the *Other Health Sciences* publications. The *Other Health Sciences* group of publications investigated a wider variety of subjects when compared to *Audiology*. Although the *Other Health Sciences* articles reflected more experiments on student subjects, the *Audiology* publications represented more than twice as many experiments on professional subjects as the *Other Health Sciences* articles. Overall, the sampling profile is dissimilar for *Audiology* when compared to the *Other Health Sciences* publications.

***Instrumentation***

**Table 1** is a display of the various instruments administered in the experimental studies reported in our literature search. The first column lists the publication author, which is followed by the assessment tools reported in the article. Overall, 21 (84%) articles used a survey (questionnaire) and 4 (16%) used an interview procedure. The rate of questionnaire use in studies that included *Audiology* was 83%, compared to 85% for *Other Health Sciences*. By comparison, the rate of interview use *Audiology* publications was 17%, compared to 15% for *Other Health Sciences*. From the studies that administered surveys (**Table 1**), we determined that 24% used the Readiness for Interprofessional Learning Scale (RIPLS), 24% used the Interdisciplinary Education Perception Scale (IEPS), 8% used the Interprofessional Attitudes Scale (IPAS), 4%

used the Interprofessional Professionalism Assessment (IPA), 4% used the University of West England Interprofessional Questionnaire (UWEIQ), and 20% did not specify the type of survey that was used or created their questionnaire. Several other tools were mentioned in the articles and some studies administered multiple tools. Questionnaires were found to be the most common tools administered in *Audiology*-inclusive studies and were administered in a variety of forms such as electronic, paper, and pre-and post-study delivery, involving open- and closed-ended questions. The data (**Table 1**) indicates that the *Audiology* studies appeared to lack the utilization of validated IPE surveys, whereas the *Other Health Sciences* articles used mostly validated, more common instruments. The *Other Health Sciences* publications reported the use of multiple survey tools at a higher rate than the *Audiology* articles, 28% versus 0%, respectively.

***Observations***

Within the *Audiology* publications, investigators suggested opportunities for improvement that included (1) the need for equal representations of all professions invited to participate, (2) participating disciplines should have a similar background and terminology knowledge set, (3) a variety of students in different stages of their programs should be invited, and (4) use surveys that track the effect made on participants (e.g., pre/post surveys). There were 18 improvements abstracted from the *Audiology* articles and 25 from the *Other Health Sciences* (**Table 2**). The most prevalent improvement suggested for *Audiology* was *expand sample of disciplines,* which was suggested in 3 articles, meaning, more disciplines should be added to the study to be more inclusive and representative. Other improvements suggested by authors in the *Audiology* articles were: *allow for equal representation of professions, assign groups to ensure IP communication, deliver survey in alternative fashion, expand sample for increase session attendance, expand sample of institutions, expand sample of learners, extend length of study,*

*involve Audiology to enhance understanding, more representation of range of years of work experience, recruit new unbiased subjects, pre-expose participants to expectation of study, recruit subjects familiar with counterpart terminology, recruit IPE faculty for study, rack subjects to ensure completion of study,* and *use students with same knowledge background.*

Within the *Other Health Sciences* publications, investigators suggested opportunities for improvement that included (1) expanding studies to represent multiple institutions, (2) a need for longitudinal data to obtain improvement measures, (3) a variety of students in different stages of their programs should be invited, and (4) the need for equal representations of all professions invited to participate. For *Other Health Sciences* (**Table 2**), the main improvements that were reported were *expand sample of disciplines,* which was suggested in 5 articles; *extend length of study* (3 articles)*; distribute profession more equally* (2 articles); *use students with same knowledge background* (2 articles). Publications from *Other Health Sciences* reported that longer investigations, more representatives across professions, and the use of students with similar academic backgrounds would improve study outcomes. Other improvements suggested by authors in the *Other Health Sciences* articles were: *designate moderators for each group, add demographics and cultural background to questionnaire, assess transfer of learning to clinical applications, develop a questionnaire, expand sample of institutions, expand sample of learners, implement focus groups for insights, involve more realistic scenarios, involve multiple institutions, provide opportunity for assessment of teamwork, track subjects to ensure completion of study, use one communication style between groups, and use positive and negative statements in questionnaires.*

# CHAPTER 3
# DISCUSSION

## *Benchmark Data*

Some response data from audiologists for select items extracted from the American Speech-Language and Hearing Association (ASHA) surveys administered between 2016 and 2023 are displayed in **Figure 2**. Over this period, the sample sizes range from 170-430. It is estimated that there are nearly 14,000 audiologists in the U.S. (Bureau of Labor and Statistics, 2022); hence, the response rate is small and should be interpreted with caution. Nevertheless, the ASHA survey is the only national study that has been consistently administered to audiologists. So, although the samplings are small, we used these surveys to attempt to characterize IPE and IPC in audiology, specifically, in terms of training, readiness to lead and participate, roles and responsibilities, and engagement in collaborative practice.

Five items were selected and used to estimate the recent status of IPE and IPP in the profession of audiology (ASHA, 2016; ASHA, 2017; ASHA, 2019; ASHA, 2021; ASHA, 2023). **Figure 2** captures the by-year data for these items. The first item selected was, “Have you had any formal education or training on IPP (academic or clinical coursework in IPP, professional development activity specifically on IPP, etc.)?” For this item, the unweighted mean of the reported rate for each survey year was 31.5%. So, roughly one in every three audiologists reported having formal IPE. The survey data suggested that most audiologists have acquired IPE on the job (84%), followed by self-taught (53%), in a conference setting (17%), and various other methods (ASHA, 2019). The next item of interest asked the question, “How prepared do you feel you are to lead an IPP team of multiple (health care or education) professionals?” For this item, the unweighted mean of the reported rate for each survey year was 17.9%, so less than

20% of audiologists were ready to lead an IPC team. The first item selected was, “How prepared do you feel you are to effectively participate on IPP teams?” For this item, the unweighted mean of the reported rate for each survey year was 38.3%, which indicated that less than half of the audiologists appeared adequately prepared for collaborative practice. We investigated the outcomes from, “The team talks together about our professional similarities and differences (*Almost always* and *most of the time*)” and, the unweighted mean of the reported rate for each survey year was 61.3%. Hence, of those audiologists who are participating in IPP, almost two-thirds of them have reported discussing roles and responsibilities with their teammates. Finally, we examined the item, “Given your ratings of IPP competencies in this survey, have you engaged in interprofessional collaborative practice in your primary work setting in the past 12 months?” For this item, the unweighted mean of the reported rate for each survey was 73.6%, which suggests that almost three of every four audiologists believe they are engaged in IPP at work.

***Interprofessional Education***

From the ASHA (2016-2023) survey data, it appears that audiologists are not prepared to lead or participate in an IPP team. Furthermore, the ASHA data indicated that those who do engage, likely do so because of on-the-job training, and reported learning the roles and responsibilities of their team members. Although more conference and asynchronous continuing education could be offered for professionals, and methods of facilitating advanced training in the workplace could be organized, audiology programs should be delivering more refined didactic and practical education opportunities for doctoral students. It appears that the graduate audiology curriculum should also include IPE on IPP team leading and IPP participation, as well as improved recognition of the roles and responsibilities of other clinical personnel.

This project aimed to describe the foundational connection between audiology and IPE in published scientific reports and to capture the common tools used in audiology IPE and IPP research. After reviewing the literature and analyzing IPE and IPP publications that included audiology and did not include audiology, we discovered that studies that included audiology may have lacked the use of validated IPE surveys, and publications that did not include audiology did use validated IPE surveys at a higher rate. In the publications that included audiology, IEPS, and RIPLS were the most common tools utilized throughout IPE case studies. This appears to suggest that there is an opportunity to adopt a standardized questionnaire tool that could be used to collect response data in audiology IPE studies, or one could be created.

In some instances, various reports that were reviewed suggested ways in which their research could have been improved. Numerous improvements were raised but only one was found in publications that included audiology and those that did not include audiology, and this author-suggested improvement recommended an expansion of the sample of the disciplines. This was the most cited improvement across the publications reviewed. From this observation, it is apparent that audiology should develop more outreach for students and professionals to become engaged in IPE and IPP research as investigators and study participants.

# CHAPTER 4
# CONCLUSION

## *Recommendations*

Interprofessional practice is intended to develop collaboration between healthcare professionals to improve outcomes for patients and families. Academic audiology programs build competency in IPP through IPE. In IPE, experiences should expose students and professionals to the clinical benefits, teaching opportunities, and patient outcomes resulting from IPP. Although interdisciplinary clinical training poses logistical challenges, several teaching tools are available for use with health science students that could be adopted by audiology training programs (Joseph et al., 2024). We were able to describe the foundational connection between audiology and IPE in the scientific literature.

The literature reported that the use of cooperative learning, skill mastery, and best practices may enhance IPE. Faculty should consider the use of evidence-based teaching, setting clear expectations, and building on prior knowledge to enhance their IPE programs. To develop an optimally diverse IPP culture, faculty should facilitate ongoing collaboration between audiologists, nurses, and other health science instructors in the academic network. For example, collaborative practice opportunities with numerous medical specialists were described by Joseph et al. (2020) and the National Academies of Practice, however, the basis of these professional interactions should be incorporated into doctoral audiology IPE. Ultimately, IPE should be integrated into the development of health science faculty and clinical instructors. Faculty and clinical leaders should ensure that regular meetings, clear communication, research collaboration, and an effort to produce common goals are important for IPE and IPP culture. Profession-centrism must be removed to achieve effective IPP and improve patient outcomes.

Audiologists consistently work alongside a diverse range of professionals to properly serve their patients. Therefore, ensuring proper IPE and IPP competencies are completed and maintained is crucial for successful engagement. Ensure audiology programs are incorporating IPP, IPE, and IPE Leadership courses. American Academy of Audiology (AAA), American Speech-Language-Hearing Association (ASHA), Academy of Doctors of Audiology (ADA), and other major organizations should include more IPE and training in their practices. National conferences could involve more interprofessional practice leadership and how to lead IPE opportunities. For example, conferences could include Grand Rounds that involve a panel of experts (outside of audiologists) who are involved in the case.

To compare outcomes between studies, it is recommended audiology select one of the tools utilized in our analysis of the other health professions and use that tool consistently. It appears that the IEPS or RIPLS, or modifications of those tools for audiology use, would be acceptable. Because they were used most frequently, those tools are the ones recommended. Finally, improvements in studies need to be made to increase the rate of participation of audiology students in IPE training. By expanding the sample of health science disciplines, to include Audiology and other specialties, future studies would be more representative. Improvements in IPE protocols, such as including students with the same knowledge backgrounds and providing an equal distribution of professions, would be significant changes that might improve participant satisfaction and program growth.

## BIBLIOGRAPHY

American Speech-Language Hearing Association (2016) ASHA's strategic pathway and you: focus on objective 2. The ASHA Leader: Feb 2016

American Speech-Language Hearing Association (2016) Interprofessional Practice Survey Results: May 2016.

American Speech-Language Hearing Association (2017) Interprofessional Practice Survey Results: May 2017.

American Speech-Language Hearing Association (2019) Interprofessional Practice Survey Results: May 2019.

American Speech-Language Hearing Association (2021) Interprofessional Practice Survey Results: May 2021.

American Speech-Language Hearing Association (2023) Interprofessional Practice Survey Results: May 2023.

Brame, J., Gibbings, E., Kowlowitz, V., McKenna, N., & Weintraub, J. (2019) Collaborative Educational Experiences of Dental Hygiene and Audiology Students. *Journal of Dental Hygiene*, *93*(2), 6–12.

BLS. (2022) Bureau of Labor and Statistics, May 2022, National Occupational Employment and Wage Estimates. https://www.bls.gov/oes/current/oes291181.htm#(1) . Retrieved: December 2023.

Carbonaro, M., King, S., Taylor, E., et al. (2008) Integration of e-learning technologies in an interprofessional health science course. *Medical Teacher: 40: 25-33.*

Clark, P. (2006) What would a theory of interprofessional education look like?: some suggestions for developing a theoretical framework for teamwork training. *J Interprof Care 20(6): 577-89.*

D'Eon, M. (2005) A blueprint for interprofessional learning. *Journal of Interprofessional Care: May 2005 (Sup 1): 49-59.*

Eaton, B. & Regan, S. (2015) Perspective of speech-language pathologists and audiologists on interprofessional collaboration. *Canadian Journal of Speech-Language Pathology and Audiology:* 39(1).

Foster, B. (1998) The role of the occupational health nurse in a hearing conservation program: a personal perspective. *Journal of Occupational Hearing Loss: 1(2): 87-88.*

Frost, J., Hammer, D., Nunez, L., Adams, J., Chesluk, B., Grus, C., Harvison, N., McHuinn, K., Mortensen, L., Nishimoto, J., Palatta, A., Richmond, M., Ross, E., Tegzes, J., Ruffin, A., &

Bentley., J. (2019) The intersection of professionalism and interprofessional care: development and initial testing of the interprofessional professionalism assessment (IPA). *Journal of Interprofessional Care*: 33(1): 102-115.

Funk, A., Garcia, C., & Mullen, T. (2018) Understanding the hospital experience of older adults with hearing impairment. *American Journal of Nursing:* 118(6).

Gilbert, J., Yan, J., & Hoffman, S. (2010) A WHO report: framework for action on interprofessional education and collaborative practice. *Journal of Allied Health, Fall 2010: 39(3:2).*

Golom, F. & Simon Schreck, J. (2017) The journey to interprofessional collaborative practice: are we there yet? *Interprofessional Collaborative Practice.*

Hall, P. (2005) Interprofessional teamwork: Professional cultures as barriers. *J of Interprofessional Care, May (Supplement 1: 188-196).*

Heassler, A. (2018) Audiology, interprofessional collaboration, & school health services. *Audiology Today, Sept/Oct 2018: 30(5).*

Hendershot, C., Pakulski, L., Thompson, A., Dowling, J., & Price, J. (2011) School nurses' role in identifying children at risk of noise-induced hearing loss. *Journal of School Nursing:* 27(5): 380-389.

IPEC. (2016) Core Competencies for Interprofessional Collaborative Practice: 2016 Update. *Interprofessional Education Collaborative*.

James J, Chappell R, Mercante DE, Gunaldo TP. (2017) Promoting hearing health collaboration through an interprofessional education experience. *Am J Audiology.* 26(4): 570-575.

Jernigan, S., Magee, C., Graham, E., Johnston, K., Zaudke, J., & Shrader, S. (2016) Student outcomes associated with an interprofessional program incorporating TeamSTEPPS. *Journal of Allied Health*: 45(2).

Jones, A. and Jones, D. (2011) Improving teamwork, trust and safety: An ethnographic study of an interprofessional initiative. *Journal of Interprofessional Care:* 25: 175–181.

Joseph, A., Shoup, A., and Huckabay, K. (2020) Opportunities for Audiology to Advance Inter-professional Collaboration. NAP Annual Meeting & Forum, Innovations in Interprofessional Collaboration: Scholarship, Practice, and Advocacy, March 12-14, 2020, San Diego, California.

Joseph AR, Wright VM, Watkins SM, Goddard SE, Mast DD. (2023) Evaluation of the performance of a card game to introduce students to interprofessional collaboration: a randomized 2-group comparison study. *Nurse Educ*. 00(0):1- 6 (released online ahead of print).

Klocko, D., Krumwiede, K., Oliveares-Urueta, M., & Williamson, J. (2012) Development, implementation, and short-term effectiveness of an interprofessional education course in a school of health professions. *J. of Allied Health, Spring, 41:1.*

Lairamore, C., George-Paschal, L., McCullough, K., Grantham, M., & Head, D. (2013) A case-based interprofessional education forum increases health students' perceptions of collaboration. *J. of International Association of Medical Science Educators,* 23(3S)L 472-481.

Laubach, G. (2010) Speaking up for older patients with hearing loss. *Nursing 2010: January.*

Lazar, A., Kauer, R., & Rowe, D. (2015) Hearing difficulties among experienced dental hygienists: a survey. *Journal of Dental Hygiene:* 89(6).

Mogole, et al. (2019) Knowledge of final year, medicine, pharmacy, audiology, and nursing students in South Africa on drug-induced ototoxicity: A pilot study *South African Journal of Communication Disorders.*

Namazi, M., Holan, G., McKenzie, S., Anuforo, P., Pax, J., Knis-Matthews, L., & Marks, D. (2019) An exploratory survey study of grand rounds as an interprofessional education tool for graduate students in the health professions. *Perspective of the ASHA Special Interest Groups, 1-8.*

Page, C., Christopher, K., Simpkins, L., Humphrey, C., Jones, L., & Sciascia, A. (2021) "Where I am weak, they are strong": students' perceptions and attitudes towards interprofessional education. *J. of Allied Health Sciences and Practice,* 19(2).

Pecukonis E, Doyle O, & Leigh, D. (2008) Reducing barriers to interprofessional training: promoting interprofessional cultural competence. *Journal of Interprofessional Care,* 22(4): 417-428.

Pickering, J. & Embry, E. (2013) So Long, Silos. *The ASHA Leader*.

Pien, L., Stiber, M., Prelosky, A., & Colbert, C. (2018) Interprofessional educator development. *Perspect Med Educ 7: 214-218.*

Rose, M., Smith, K., Veloski, J., Lyons, K., Umland, E., & Arenson, C. (2009) Attitudes of Students in Medicine, Nursing, Occupational Therapy, and Physical Therapy Toward Interprofessional Education *Journal of Allied Health;* Winter 2009.

Shrader, S., Kern, D., Zoller, J., & Blue, A. (2013) Interprofessional teamwork skills as predictors of clinical outcomes in a simulated healthcare setting. *Journal of Allied Health:* 42(1).

Smith, B., & Anderson, K. (2019) Attitudes toward interprofessional education: comparing physical therapists and other health care professions' students. *Journal of Physical Therapy Education, 32(2), 183-190.*

Trommelen, R., Hebert, L., & Nelson, T. (2014) Impact on physical therapy and audiology students of an interprofessional case-based learning experience in education of vestibular disorders. *Journal of Allied Health: 43 (4).*

Torkko, E., Sorri, M., & Jarvelin, M-R. (1997) More education in pediatric audiology needed for child welfare clinic nurses and doctors. *Public Health: 111, 93-96*.

VandeWaa E, Rudd A, Estis J, Gordon-Hickey S. (2019) Safe medication administration in patients with communication disorders: A simulation-enhanced interprofessional education approach. *J Allied Health, Winter, 48:4.*

Volkers, N. (2016) Bridging the professional divide. *The ASHA Leader: Nov 2016.*

Wellmon R, Gilin B, Knauss L, et al. (2012) Changes in student attitudes toward interprofessional learning and collaboration arising from a case- based education experience. *Journal of Allied Health; 41:26-34*.

World Health Organization.(2010).Framework for action on interprofessional education and collaborative practice. *WHO Press.*

## TABLES AND FIGURES

**Figure 1.** Classification of subjects for audiology and other health sciences research publications. The dark bars on the left represent Audiology and the grey bars on the right reflect the Other Health Sciences. One of the Other Health Sciences publications included professionals and students, so the data are not mutually exclusive.

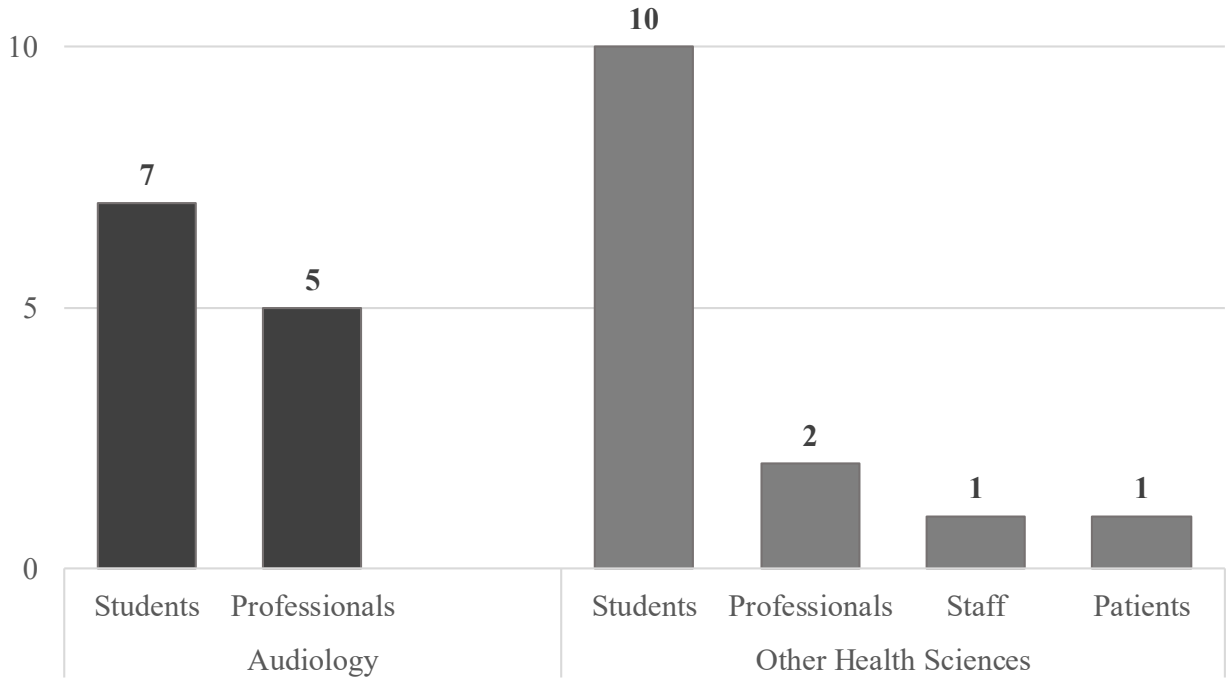

**Figure 2.** Response data from audiologists for select items extracted from the American Speech-Language and Hearing Association (ASHA) surveys over the period 2016 (n=170), 2017 (n=288), 2019 (n=430), 2021 (n=286), and 2023 (n=173). Taken from the ASHA site: https://www.asha.org/research/memberdata/interprofessional-practice-survey/ as recently as 12/28/23.

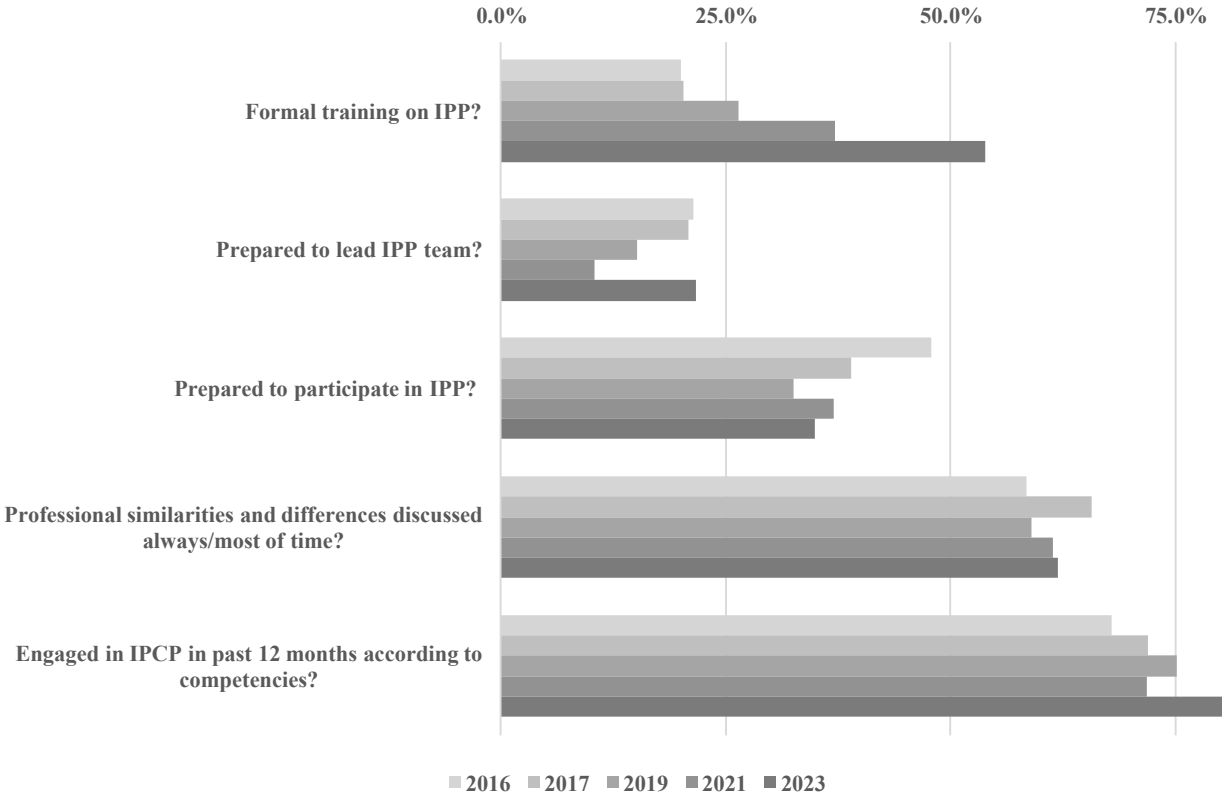

**Table 1.** Authors and the tools administered for scientific publications that included Audiology (upper) and publications that did not include Audiology (Other Health Sciences) (lower).

| Author | Tools administered |
|---|---|
| **Audiology** | |
| Brame, J, et al. (2019) | Questionnaire |
| Eaton, B. & Regan, S. (2015) | Online survey (22 items related to IPP) |
| Frost, J., et al. (2019) | IPA |
| James, J., et al. (2017) | Pre- and post-questionnaire |
| Jernigan, S., et al. (2016) | Pre- and post-questionnaire |
| Lazar, A., et al. (2015) | Written questionnaire |
| Mogole, O., et al. (2019) | Questionnaire |
| Pien, L., et al. (2018) | Written questionnaire |
| Torkko, E., et al. (1997) | Interviews |
| Trommelen, R., et al. (2014) | Pre- and post-questionnaire |
| VandeWaa, E., et al. (2019) | Pre- and post-questionnaire |
| Volkers, N. (2016) | Interview |
| **Other Health Sciences** | |
| Carbonaro, M., et al. (2008) | UWEIQ; TOSCE |
| Funk, A., et al. (2018) | Interview |
| Hendershot, C., et al. (2011) | Written questionnaire |
| Jones, A. & Jones, D. (2011) | Interviews |
| Lairamore, C., et al. (2013) | IEPS, RIPLS |
| Klocko, D., et al. (2012) | Communication Skills Survey |
| Namazi, M., et al. (2019) | 6-iteam electronic survey |
| Paige, C., et al. (2021) | RIPLS, IEPS, and reflective essays |
| Pechak, C., et al. (2018) | RIPLS and IPAS |
| Rose et al. (2009) | IEPS and RIPLS |
| Shrader, S., et al. (2013) | IEPS, TWS, and COS |
| Smith, B., & Anderson, K. (2019) | Pre- and post-questionnaire |
| Wellmon, R., et al. (2017) | IEPS, RIPLS, ATHCTS |

Abbreviations: Interprofessional Practice (IPP), Interprofessional Professionalism Assessment (IPA), The University of West England Interprofessional Questionnaire (UWEIQ), The Team Objective Standardized Clinical Examination (TOSCE), Readiness for Interprofessional Learning Scale (RIPLS), Interprofessional Attitudes Scale (IPAS), Interdisciplinary Education Perception Scale (IEPS), Teamwork Score (TWS), Clinical Outcome Scores (COS), Attitudes Toward Healthcare Teams Scale (ATHCTS)

**Table 2.** Areas for improvement suggested by authors for scientific publications that included Audiology (left) and publications that did not include Audiology (Other Health Sciences) (right). The shaded area contains the most prevalent suggested improvements for both groups.

| **Audiology Improvements (18)** | **Other Health Science Improvements (25)** |
|---|---|
| expand sample of disciplines (3) | expand sample of disciplines (5) |
| | extend length of study (3) |
| | distribute profession more equally (2) |
| | use students with the same knowledge background (2) |
| *allow for equal representation of professions* | *designate moderators for each group* |
| *assign groups to ensure IP communication* | *add demographics and cultural background to the questionnaire* |
| *deliver survey in alternative fashion* | *assess transfer of learning to clinical applications* |
| *expand sample for increased session attendance* | *develop a questionnaire* |
| *expand the sample of institutions* | *expand the sample of institutions* |
| *expand the sample of learners* | *expand the sample of learners* |
| *extend the length of the study* | *implement focus groups for insights* |
| *involve Audiology to enhance understanding* | *involve more realistic scenarios* |
| *more representation of the range of years of work experience* | *involve multiple institutions* |
| *recruit new unbiased subjects* | *provide the opportunity for assessment of teamwork* |
| *pre-expose participants to the expectations of the study* | *track subjects to ensure completion of study* |
| *recruit subjects familiar with counterpart terminology* | *use one communication style between groups* |
| *recruit IPE faculty for study* | *use positive and negative statements in questionnaires* |
| *track subjects to ensure completion of study* | |
| *use students with same knowledge background* | |