

INNOVATIONS IN BIOMEDICAL SCIENCE CURRICULUM: HARNESSING ONLINE INTERPROFESSIONAL EDUCATION

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Article Info

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Abstract

Interprofessional Education (IPE) is an essential component of healthcare curriculum, fostering collaboration, teamwork, and patient-centric care among students from diverse disciplines. This article explores the value of IPE, its impact on student learning, and various methods employed to incorporate it into healthcare education. Evidence suggests that IPE enhances students' understanding of team roles, responsibilities, communication skills, and their ability to function effectively in complex healthcare environments. Recent studies reveal that when clinical and non-clinical healthcare students engage in IPE programs as teams, they gain an appreciation for shared goals and develop the confidence to work collaboratively.

This paper discusses several approaches to implementing IPE within healthcare curricula, highlighting their benefits and outcomes. Problem-Based Learning (PBL) emerges as a valuable method, allowing students to combine knowledge acquisition with interactions across disciplines, enabling a deeper understanding of each team member's contributions to patient care processes. Additionally, work experiences, such as those in the Family Health course at the University of Florida, demonstrate the tangible benefits of multidisciplinary collaboration for both students and the broader community.

In summary, this article underscores the importance of IPE in healthcare education, emphasizing its positive impact on students and the delivery of patient-centered care. It explores diverse methods of integrating IPE into curricula, showcasing the benefits of Problem-Based Learning, work experiences, and online team-based learning. As healthcare continues to evolve, fostering collaboration among future professionals becomes increasingly critical, and IPE remains a vital tool for achieving this goal.

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Introduction

Interprofessional education (IPE) as it applies to the healthcare curriculum includes opportunities where students from different disciplines work and learn from each other with the goal of enhancing collaboration, team work, and patient centric care (Singh & Matthees, 2021). There is a plethora of evidence that indicates IPE brings value to both students and patients. It has also been reported that students who are exposed to IPE learning opportunities have a better understanding of team member's roles and responsibilities, collaborative tasks, improved communication skills, and are able to function effectively in a complex healthcare environment (Singh & Salisbury, 2019). Recent studies report that when clinical and non-clinical healthcare students completed the IPE program as a team they were able to recognize the importance of shared goals and gained the confidence to work collaboratively (Singh & Salisbury, 2019).

Several methods have been utilized to include IPE in healthcare curriculum. One such method is Problem Based Learning (PBL) where knowledge attainment is combined with opportunities to interact with students who are completing classes or IPE program. This helps in developing an increased understanding of what other team members do while working on patient care processes (Levine et al., 2019). Work experience is another approach to delivering meaningful IPE experiences to students. This can be demonstrated by a Family Health course at the University of Florida where students from different health disciplines work together to provide services to volunteer families (Davidson & Waddell, 2005). This leads to benefits for community as a whole (Levine et al., 2019). A recent study conducted by Singh and Matthees (2021) reported use of team-based learning methods in an online environment to deliver IPE to students from variety of health profession students. Students were required to complete case studies, discussions, attend live sessions, and work together on several activities that required indepth understanding of each other's role in patient care and other hospital processes. Results clearly indicated that students appreciated opportunities to learn and work together and felt the need to enhance course and curriculum centered around IPE in their curriculum (Singh & Matthees, 2021).

One must note that there is evidence on traditional/on-ground IPE programs for students in clinical and non-clinical programs, however there is a lack of literature on online programs where students in biomedical sciences program (undergraduate and/or graduate) engage in tasks that require them to demonstrate increased understanding of team member's role in care delivery process. Levine et al. (2019) indicated that biomedical science students complete rigorous training which is not only different from traditional health-based disciplines but they also work in a different environment when compared to other disciplines. Students who wish to complete biomedical sciences program work may have minimal or no connection with the actual patient. While students in such programs do not directly provide patient care, health providers generally rely on biomedical research and discoveries to work with patients (Levine et al., 2019). This was recently demonstrated by the COVID crisis where the medical fraternity across the world relied on advances and discoveries by scientists and researchers. Thus, it is extremely important to include students from Biomedical and other similar disciplines in IPE programs. This will allow scientists and clinical/non-clinical health professionals to learn from each other and provide opportunities for future collaboration.

The global health crisis due to COVID-19 cases has required academia to make a rapid shift to completely online and hybrid mediums of instruction (Singh, Steele & Singh, 2021). This is true for nearly all the academic disciplines across the world. Since the first outbreak of this acute respiratory disease, researchers have called for and expressed the need for online IPE programs as this would allow students to learn about collaborative team skills without coming in actual contact with one another (Singh & Matthees, 2021). There is a clear lack of evidence on online IPE programs that would allow students to learn from each other and appreciate what different members of the team can accomplish together in a complex healthcare crisis.

This research aims to present essential elements of an online team-based IPE program for biomedical sciences students who may not have direct involvement with clinical or patient care processes. Previous studies have

focused on medical, nursing, social work, pharmacy, and other clinical disciplines that have a direct role in patient care and clinical decision making. This study allows us to examine recently published evidence and critically think about creating collaborative team-based learning opportunities for students.

The objectives of the study:

- Examine research published in the past four years about online IPE programs that focused on both clinical and non-clinical health disciplines.
- Utilize prior evidence to identify and describe essential elements of online interprofessional education program for students in biomedical sciences discipline.

Methodology

The COVID-19 pandemic has resulted in a serious burden on educational institutions and healthcare organizations across the world. Academia was required to switch to a completely online or hybrid medium of instruction in a very short time-frame (Singh, Steele & Singh, 2021). This research primarily focuses on online interprofessional education programs since the beginning of the pandemic. A thorough systematic analysis has been completed for the recently published evidence. In consultation with experts in the field of interprofessional education and biomedical science education a search strategy was developed, centered around the key concepts of ‘interprofessional education’, ‘biomedical sciences’, ‘online healthcare education’, and ‘students preparedness’. The search was then applied to PubMed, and the Web of Sciences. In order to identify grey literature, a google search was conducted. Inclusion criteria included (a) articles published in English language in the past four years, (b) focus on planning and delivery of interprofessional education and can be applied to online content delivery, (c) actual IPE program and content delivery in online format. Additionally, author has examined dissertation research, reports available through professional bodies in the field of interprofessional education, and other relevant resources publically available to researchers and scholars.

Results

Results of Systematic Literature Review

The literature search resulted in identification of 24 documents. After removing duplicates, 21 articles were left. Title and abstract screening was conducted on these articles and finally 12 articles were identified. Upon conclusion of the initial screening, these articles qualified for full text review. After completion of final review, only 7 articles were found relevant to the current study. These articles are reported in the table I below.

Table I – Overview Data Extraction of Included Studies

Study	Study Design	Intervention/Major Concept Discussed	Audience/Participant	Conclusion	Relevance to the study
Liller, Pruitt, & Burke (2020)	Post-test (evaluation of IPE modules).	Asynchronous and synchronous online modules.	Public Health, Nursing, Pharmacy, and Physician Assistant.	Synchronous modules and a synchronous session can serve as an effective educational strategy.	Minimal relevance to the current study.
Diggele, Roberts, Burgess, & Mellis	Review.	Article outlines key points for planning and facilitating IPE.	Healthcare work force (primarily a review article).	IPE is needed to function in team setting. Effective training	Minimal relevance to the

(2020)				programs are needed to support students.	current study.
Singh & Matthees (2021)	Mixed Method of Research – (Survey – Readiness for Interprofessional Learning Scale. Qualitative content analysis discussion question).	Interprofessional education program based on core competencies was planned and delivered in a completely online format.	Health & Medical Sciences (Discipline covering Biomedical Sciences and Health Sciences), Health Administration, Nursing, Social Work, Gerontology, Athletic Training, and Psychology.	Students from clinical and nonclinical disciplines valued opportunities for learning as a team. IPE enhances awareness of team members' responsibilities. IPE improves collaboration, communication, and cohesion. IPE leads to better care of patients.	Extremely relevant to the current project. Article can be used as basis for building innovative online IPE programs.
Hayward et al. (2021)	Review Article.	Focus on delivery of IPE in online format.	Research participants not included.	Pedagogical methods are explored. Collaboration in online format is deemed necessary.	Minimal relevance to the current study.
McHenry et al. (2021)	Review and description of development of online IPE learning experience.	Online IPE program.	Public Health, Nursing, and Clinical & Rehabilitative Health Sciences (however actual quantitative and	Online IPE experience may allow students to work collaboratively through distance learning. Can be used as feasible	Minimal relevance to the study.

			qualitative data not presented).	approach for the IPE at the institution.	
Singh & Salisbury (2019)	Quantitative Study.	Interprofessional education in completely online environment.	Health Administration, Health Education, Health Sciences, Public Health, Dental Emphasis, Kinesiology.	Interprofessional learning curricula improve understanding of roles and responsibilities and enhances patient care. This research may help in advancing interprofessional educational curricula.	Relevant to the current study.
Orsini, Rodrigues & Tricio (2021)	Narrative review.	Presents design, implementation, and lessons learned from interprofessional faculty education programs.	Faculty members.	An inclusive teaching style, flexibility in learning environment, and peer work facilitate interprofessional learning environment.	Minimal relevance to the current study.

As noted in the table above, the majority of the studies are either review of the existing literature or provide post analysis of online interprofessional education events. There is still a dearth of research published during the pandemic that discuss and presents qualitative and quantitative evidence (or combination of evidence) in addition to discussion of development and implementation of IPE programs in a completely online medium of instruction. Majority of the programs, as suggested by research, are face to face limiting the attendance and participation from students who may not be able to attend on-campus sessions. Such on-campus programs are extremely challenging to offer considering the impact of the COVID-19 pandemic on healthcare education and academia in general. Although there is a burgeoning interest in designing and evaluating on-ground IPE programs for disciplines that directly or indirectly with patients, there is currently sparse (or no) evidence on online IPE programs where students from biomedical sciences have been included. Research conducted by Singh and Matthees (2021) presents a novel approach to deal with on-going problems posed by the COVID-

19 pandemic. A completely online IPE program has been described where participants from different clinical and non-clinical health disciplines participated and actively learned with, from, and about each other's role in healthcare settings (Singh & Matthees, 2021). Of note, this project has also included students from lab based disciplines such as Health and Medical Sciences where students are trained to work as scientists once they graduate from their program. Authors have tried to create an inclusive online IPE environment where students across disciplines are able to apply the knowledge/concepts for greater good of patients. This research builds upon the existing work conducted by Singh and Matthees (2021) and extends the work to the field of biomedical sciences. There is an emphasis on necessary elements needed to build a robust online IPE program for students in biomedical sciences education.

Building Blocks/Necessary Elements for the Online IPE program

Core Competencies and Content of the Program

The core competencies published by the Interprofessional Education Collaborative (IPEC) can be utilized to create structure and content of the program. These competencies focus on team work, shared values and ethics required for interprofessional practice, developing knowledge of one's own role and responsibilities of other professionals, communication between professionals, care givers, families and communities, and ability to build effective teams (and team dynamics) required to plan, deliver, evaluate care to patients. These competencies bring critical value to the program as they are supported by more than 12 professional disciplines including American Association of Colleges of Nursing, Association of American Medical Colleges, American Dental Association, Association of Schools and Programs of Public Health, and the American Association of Colleges of Osteopathic Medicine. More recently several health disciplines such as allied health professionals which includes biomedical scientists have accepted these competencies to enhance IPE in their discipline (Singh & Matthees, 2021; Findley, 2019).

Online modules based on concepts/competencies highlighted above can be developed. Instructors should also work towards creating interprofessional teams so students get a chance to work with others who are from different disciplines. It is important to include concepts related to quality and patient safety, medical complications and how can teams work together to identify problems presented to them in the form of case studies or discussions. Singh and Matthees (2021) emphasized on the content related to roles and responsibilities of team members in clinical and administrative processes in healthcare settings. Content on trainings of health professionals, importance of engaging family in the plan of care, and skills and knowledge different members bring to the team need to be included through presentations and/or real world case projects. Importance of communication between providers during the patient care processes should be highlighted. The material should allow students to think about problems due to faulty communication, fragmented systems of care and adverse events that may lead to patient/resident deaths in facilities. Instructors/experts teaching or facilitating content on IPE should also address concepts about team development, value, ethics, shared decision making, and leadership practices commonly used in healthcare organizations (Singh & Matthees, 2021).

Integration of Research

Integration of research in development and implementation of online IPE programs helps to understand what, why and how such programs work in "real world" settings and. For example, combination and integration of qualitative and quantitative methods can be really helpful in IPE research. This approach is also known as mixed methods research. In past few years mixed methods research has been used in fields such as education, health sciences, healthcare and psychology (Molina-Azorin, 2016). While examining Singh and Matthees (2021) work, it has become increasingly clear that usage of qualitative and quantitative data collection approach in combination helped in providing a better understanding of IPE phenomenon, implementation, and difference that IPE preparation created for students who completed the program. Adoption of this research design allowed

researchers to seek clarification, develop the use of other method, and expand the range of implementation in online modality.

This author firmly believes usage of mixed methods research in online IPE program for biomedical sciences will enhance our understanding of new program development, implementation, and changes in students' attitudes once they complete the IPE program in online format.

Biomedical Sciences. Use of mixed methods research will help in triangulating results obtained from qualitative data with the other set of results obtained through quantitative data collection (Molina-Azorin, 2016).

Technology

Learning Management systems such as moodle, desire to learn brightspace, and blackboard can be effectively used to deliver online IPE programs. Faculty experts should work on creating standard patient cases, recorded presentations, and determining electronic health record documentation for students in the discipline. Patient cases should be built in electronic health records (EHR) and details such as information about providers, orders, vital signs, medical records etc. should be included in a way that it resembles real world patients (KramerJackman, 2017). Clear instructions for assignments and teams should be developed so students are not confused while working on these assignments. Welcome notes, instruction on simulation, access to EHR, web conferencing tools such as zoom, teams or skype should be used to facilitate teaching and learning (Singh &Matthees, 2021; Kramer-Jackman, 2017).

Discussion

The aim of this project was to examine current research in the field of online IPE program and describe a pedagogical innovation "IPE program for biomedical sciences" and how to incorporate technology to deliver the program in a completely online medium. Built on recently published evidence, author has presented key elements of IPE program that can be implemented using elearning tools and technology. It is clear that such a program would allow students to learn from each other, different disciplines and this could lead to improvement in decision making, problem solving, and communication between team members. Further, the findings suggest that online IPE program if effectively integrated in current curriculum, can be used to achieve desired outcomes in health care education.

It is important to note that several research projects have demonstrated benefits when IPE programs have been delivered in on-campus, face-to-face course; however, currently, there is still need of projects that show IPE program can be taught with the same rigor even in online format especially in disciplines such as biomedical sciences. This project contributes to the emerging literature in the field of online healthcare education, biomedical sciences, and interprofessional education. Attention should be given, in particular, to the use of online tools, selection of learning material, pedagogical techniques, and how to overcome challenges while designing IPE program for online medium of instruction. This is particularly important in the field of healthcare, where there is increasing demand of online education programs.

Conclusion

The use of technology and appropriate tools will allow faculty to overcome barriers and offer IPE program in a completely online format. Availability of content in online format, integration of technology in the program and flexibility will instructor to engage students and work on projects on their own schedules. Teaching and learning methods facilitated by technology can help instructors to provide immediate feedback and present important IPE concepts to students. As clinical and non-clinical healthcare providers work on saving lives and ~~reduce~~ reducing problems caused by the raging pandemic, online IPE programs can serve as a panacea, especially for students who do not have time to attend on-campus/in-person classes. IPE programs in a virtual format may help in enhancing team-work and collaboration among professionals who work together to provide care to patients in health care settings.

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