

## Teaching and Learning about Interprofessional Collaboration Through Student-Designed Case Study and Analysis

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Learning activities to develop interprofessional collaboration align with goals for professional preparation to improve health outcomes. A problem-based case study approach can offer formal and informal learning interactions that promote information exchange and collaborative practice. The purpose of this instructional article was to describe a five-stage student-designed case study and analysis activity to accomplish student learning outcomes for developing knowledge and skills in evidence-based case analysis through interprofessional collaboration. Four main learning outcomes included gaining knowledge of other professions, planning and reviewing care interventions, evaluating outcomes of other practitioners, and facilitating inter-professional case conferences and team working. An example case scenario and lessons learned are presented. This paper offers key learning points for educators and students related to the literature in problem-based learning and interprofessional education. The results confirm the feasibility of student-designed case studies as a problem-based experiential learning activity. Potential benefits for students include increased knowledge of, and appreciation for, other disciplines gained through practicing and reflecting on peer feedback. Information exchange between the students allowed interprofessional learning to occur. Students from different disciplines collaborated in the development of strategies for planning, implementing, monitoring, and evaluating a health program.

The World Health Organization advocates for interprofessional education (IPE) that occurs “when students from two or more professions learn about, from, and with each other to enable effective collaborative practice and improve health outcomes” (WHO, 2010). In 2011, the Interprofessional Collaborative Practice (IPEC) panel report proposed interactive learning and competencies for health students from different disciplines to prepare for “deliberatively working together” to improve community and population health systems (IPEC, 2011). Interprofessional collaboration was defined in the Canadian Interprofessional Health Collaborative (CIHC) national competency recommendations as “[a] partnership between a team of health providers and a client in a participatory, collaborative and coordinated approach to shared decision-making around health and social issues” (CIHC, 2010). In 2016, the IPEC panel of experts expanded from 6 to 15 professional organizations. Their updated guidelines placed interprofessional collaboration as a central domain in IPE (IPEC, 2016). This signified a growing priority for educators in health professions to develop formal and informal learning activities that advance students’ abilities with interprofessional collaboration (CIHC, 2010; Gambescia, 2017; IOM, 2013; WHO, 2010;). Related to these national efforts, the Global Forum on Innovation in Health Professional Education requested that an Institute of Medicine (IOM) consensus committee examine the evidence on the impact of IPE. This IOM committee proposed that knowledge and skills with interprofessional collaboration occur during prelicensure and graduate education in professional programs. Their report included a

framework wherein development of these collaborative competencies happens while students develop profession-specific skills rather than outside the standard curriculum (IOM, 2015). Collectively, these organizations described the relevance and timing of IPE for improving health systems.

Guidelines for the development of teaching and learning activities to integrate IPE into professional education can be drawn from the literature on the socio-cultural learning theory, competency-based learning, and problem-based learning. The socio-cultural learning theory, within the context of constructivist approaches introduced by Vygotsky, has been applied in the field of medical education among others (Nalliah & Idris, 2014; Salomon & Perkins, 1998). It highlights the important influence of students working together and learning from each other to reach the next area of potential development (e.g., active experimentation, scaffolding, the Zone of Proximal Development) (Chaiklin 2003; Nalliah & Idris, 2014; Vygotsky, 1978). As others have identified, the constructivist framework can lend itself to IPE as an interactive and socialization process (Casmiro, MacDonal, Thompson, & Stodel, 2009; Olenick, Allen, & Smego, 2010).

Barr’s model for competency-based interprofessional education described key abilities relevant to various stages on the learning continuum (Barr, 1998). These include: (1) recognize and respect the roles of other professionals, (2) jointly plan and review care interventions, (3) evaluate the outcomes of another practitioner’s work, and (4) facilitate interprofessional case conferences and teamwork. Olenick and colleagues (2010) conducted a concept analysis of IPE and noted that the processes conducive to interprofessional

learning included problem-solving and critical thinking. The interprofessional learning continuum model, designed to guide assessment of IPE from education-to-practice, included collaborative behavior, as well as knowledge and skills, attitudes, and perceptions of other professionals as learning outcomes (Hammick, Freeth, Copperman & Goodsmann, 2009; IOM, 2015). Within the list of learning methods for IPE, exchange-based learning, such as case studies, allowed students to compare views and experiences (Barr, 2002).

Problem-based learning (PBL) as an instructional approach permits students to activate their existing knowledge and present arguments on solving multifaceted problems in a wide variety of fields to gain a stronger understanding of the scientific process (Loyens, Jones, Mikkers & Van Gog, 2015). In addition, Dolmans and colleagues described PBL as “a student-centered approach in which problems are the stimulus for learning. It is characterized by: (1) learning through problems, (2) small group sessions, (3) group learning facilitated by a teacher, and (4) learning through self-study” (Dolmans, Michaelsen, Van merriënboer, & van der Vleuten, 2015, p. 355.).

The work of Engeström and Sennino (2010) described how students gain mastery toward an objective with the aid of a mediating tool. For the IPE project reported here, the object to be achieved was collaborative practice through a mediating step of case design. By asking students to concentrate on case design, we considered that the scope of learning could include a focus on the process of learning. In other words, by collaborating on case design, students would consider the impact of the collaborative process, as well as the results of fact-finding and problem-solving, thereby, drawing from the socio-constructivist perspective by which “learners create meaning from experience through interactions with other learners and with their learning environment” (Casmiro et al., 2009, p. 396). Also, this process seemed true to the “with, from and about” definition of IPE in socio-cultural learning is key to an understanding of interprofessional learning (Freeth, Hammick, Koppel, Reeves, & Barr, 2002).

The purpose of the IPE learning activity described in this article was to apply a problem-based case study approach to promote collaborative practice and information exchange between students of varying disciplines. In this instructional article we described the development and implementation of this learning activity with an example student-designed case scenario. The resulting learning outcomes were identified through informal discussions with students. Evidence from the literature was considered with the “lessons learned” from this effort to help students become practice-ready to problem-solve and research complex problems in collaboration with other professions.

## Method

To ensure that the case study learning activity provided a platform for students from different disciplines to recognize different perspectives through interaction and collaboration, key aims were identified, the setting was selected, and course development and implementation followed. To meet the primary aim for interprofessional collaboration, students from different disciplinary backgrounds worked together in the design of a case scenario. Through their combined efforts, a case scenario that exemplified a complex problem and multiple perspectives would be incorporated in the content of the case itself. The premise of this step was that students could benefit more if tasked with collaborating to design a unique case scenario that reflected problem(s) within their own fields than they would if assigned a case scenario.

In addition, this IPE learning process was intended to meet students’ own professional competencies, as well as inter-professional collaborative practice, through shared discovery of an empirical and theoretical basis for case analysis. Thus, knowledge translation became a secondary, and complementary, aim of this learning activity. Knowledge translation was selected because it had the potential to offer students a near-authentic opportunity to develop experience with case-based problem-solving (Bhogal et al., 2011). As defined by Graham and colleagues (2006), through the process of knowledge translation students can identify gaps between desired and actual care, identify needed practice changes; and evaluate outcomes, causes, and solutions.

The setting for this innovative student-designed case activity was an inter-professional health sciences doctoral program at a large university in the Midwestern U.S.A. The doctoral program, housed in the College of Health and Human Sciences at Northern Illinois University (NIU), offers full- and part-time program options for place-bound students through blended course delivery. In the NIU program, course planning faculty envisioned the term “inter-professional” as ascribed to Hall and Weaver (2001). The NIU doctoral program promotes individuals from different disciplines working and communicating with each other. It encompasses an inter-professional learning environment in which each member provides his/her knowledge, skills, and attitudes to augment and support the contributions of others.

Most students in this program seek a research-based terminal degree to advance in academia or as principle investigators for a health agency, professional organization, or academic medical center. This instructional activity was implemented to meet program goals in a class of seven students: three males and four females. The students participating in this course were working adults of varied educational backgrounds and

Figure 1  
Criteria for case study peer review

<p><b>Peer review is a key step in the development of each final written case study and analysis report. Consider these criteria as you prepare your presentation. Audience members will use a three-point rating scale for each criteria (met, partially met, and not met), and add constructive comments for your consideration.</b></p>
<p><b>Critique criteria</b></p> <ol style="list-style-type: none"> <li>1. Case Description: Clearly identified and demonstrated a sophisticated understanding of the main issues/problems exemplified in the case study</li> <li>2. Case Content: Case incidents and details interesting and realistically portrayed</li> <li>3. Stakeholder Perspectives: Described unique perspectives of multiple key stakeholders in the case including tensions or conflicts of interest</li> <li>4. Context and Conceptual Background: Clearly situated with the appropriate details</li> <li>5. Analysis and Evaluation of Issues/Problems: Balanced, in-depth, and critical assessment of the facts of the case in light of relevant empirical and theoretical research; insightful collaborative conclusions</li> <li>6. Case Recommendations: Supported primary objectives with strong arguments and well-documented evidence; recommendations reasonable and objective</li> <li>7. Links to Course Readings and Additional Research: Excellent research into the problem, clear links to the material covered in class and more</li> </ol>

work experiences that included an associate director for rural health professions, a biology instructor, a chiropractor, a clinical research coordinator, an epidemiologist, a medical laboratory scientist, and a public health advisor.

### Course Development

We began with the end in mind in the manner of backward design (Wiggins & McTighe, 2005). From a review of curricular resources in the public domain and related literature, we highlighted the knowledge and skills for interprofessional collaboration and evidence-based case analysis. For this activity we determined the main learning outcomes to be that students would be able to:

- Collaborate to design a case scenario of an overarching research problem
- Evaluate current solutions through teamwork with people in other professional roles
- Disseminate results of an evidence-based case analysis through oral and written presentations
- Engage classmates in discussion about an overarching problem and adequacy of the evidence

- Critique case presentations in a respectful manner with an interprofessional focus

To devise evaluation criteria applicable across disciplines, we reviewed rubrics such as those from the Association for the Assessment of Learning in Higher Education. We selected a three-point rating scale, with descriptors for “met,” “partially met,” and “not met” status to offer discrete categories for peer review. The case study review criteria were drawn from examples in the public domain (see Figure 1). Lastly, we developed the learning experiences, written directions, and corresponding forms for the case study assignment that resulted in a five-stage process.

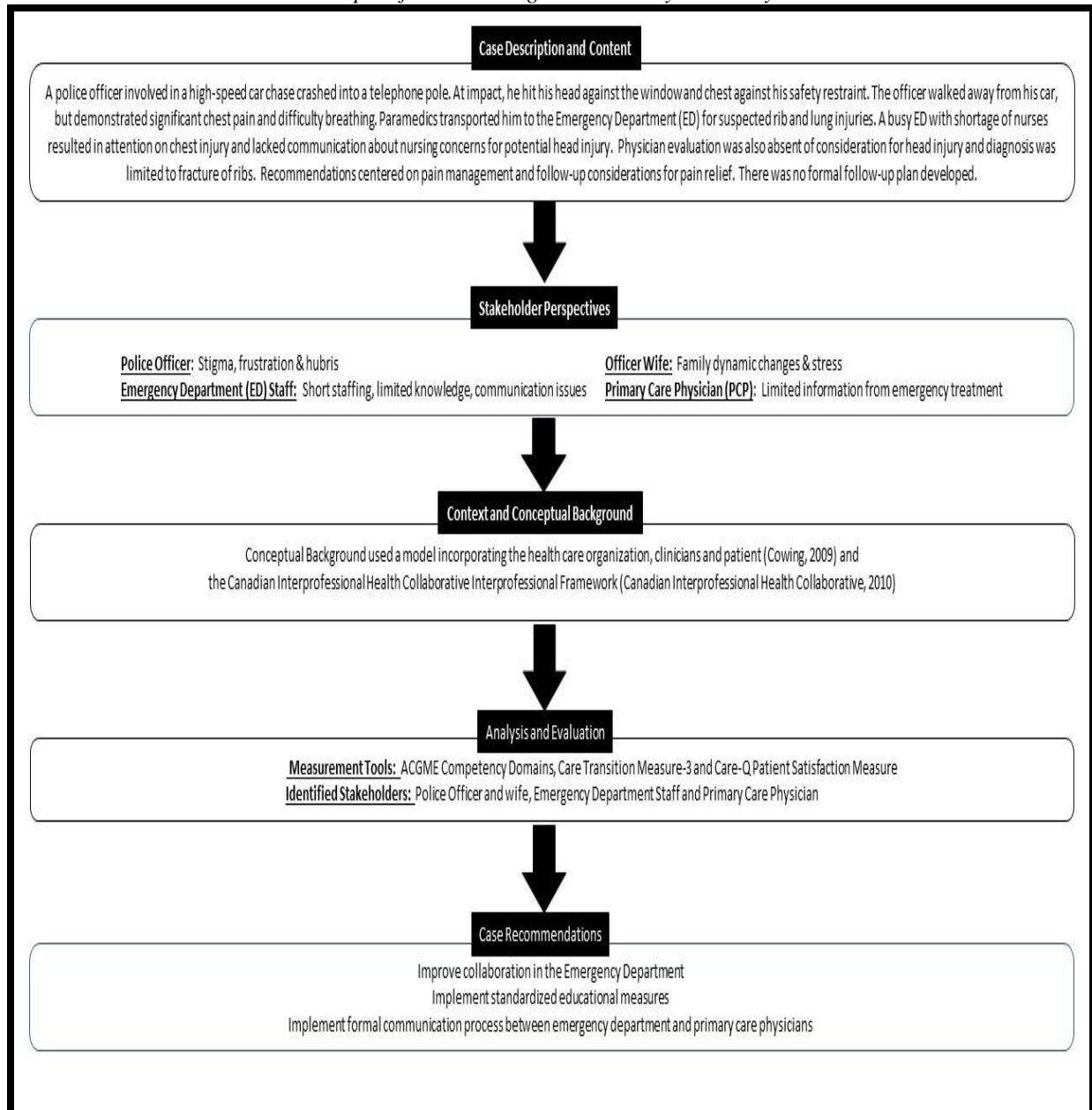
### Implementation

The IPE activity was delivered through an online platform for information sharing, discussions, presentations, and feedback. Students in the class were encouraged to share their disciplinary perspectives, literature sources, health measurement tools, and outcomes through collegial exchange.

**Stage one: Group case discussion.** Students reviewed a presentation about the purpose, scope, and evaluation of case studies through an audio-recorded module. They also participated in analysis of a case study based on the article, “Managing Everyday Ethics in Assisted Living” (Messikomer & Cirka, 2008). The template for this activity served as the format for the final case study design project. The goal of this stage was to provide students with the opportunity to practice case analysis of a healthcare issue related to aging adults. This activity encompassed a shared interest for multiple disciplines and levels of experience.

Students were instructed to write a short case analysis and post this in the online classroom discussion section responding to the following questions: (1) What immediate steps should the executive director take to manage the situation? (2) What actions or policy changes are needed over the long term? (3) What health measurements could be used to achieve goals related to these issues, such as public resources Vital Signs, Human Development Index, and Health Outcomes Core Health Outcomes Library? and (4) Provide a case

Figure 2  
Example of student-designed case study and analysis



synopsis with your recommendations and how they reflect an interprofessional focus. Students engaged in dialogue about the case from different disciplinary perspectives through the online discussion forum. Faculty provided feedback using the same rubric and criteria that would be used for the final project in order to allow students to become familiar with the case study process. This activity allowed students to observe how their classmates with different backgrounds in health approached a uniform case.

**Stage two: Inter-professional collaboration in case analysis.** In the following week, students practiced inter-professional collaboration to improve health care systems through case study review in partnership with a classmate from a different discipline. Students chose a case study from the Institute for Healthcare Improvement (IHI) and took the role of leader/champion for IPE and collaborative practice. The case studies provided opportunities to improve care across a continuum of health issues ranging from extended care to confidentiality to international issues of health care systems. The students identified the key coordinating elements required to address this case. They also provided rationale for an interprofessional approach to addressing real world issues in the delivery of quality health care. Through interprofessional collaboration, each group came to a consensus about key elements and solutions identified for the case they chose to analyze.

**Stage three: Case study design.** In this stage, students were tasked with designing a case scenario to exemplify overarching problem(s) in a health or community setting through collaboration with one or more individuals from different disciplines. Students matched up themselves into small groups. Each small group developed a case-based analysis including a comprehensive description of the context, significant issues for different disciplines, stakeholder perspectives, and credible measurements. In addition, the context of the case incorporated current industry standards and regulations, as well as relevant individual, familial, organizational, and societal issues. Regardless of the group size, the students were required to consider at least three different stakeholder perspectives in their case analysis. Finally, each small group provided empirically-based recommendations for problem solving with targeted solutions and evaluation. As an example, one pair of students combined their research interests in law enforcement and concussion-related injuries in the design of their case study (see Figure 2).

**Stage four: Case presentation and review.** Student groups presented their case studies using a PowerPoint™ format in a synchronous web-based platform. Each of the other students was asked to critique their peer's presentation in a constructive manner using the Case Study Analysis Criteria for Peer Review (see Figure 1). This allowed the student groups

to experience feedback from their peers, who often represented other disciplines. This exercise aimed to reinforce the concepts that interprofessional work is a collaborative effort and that interaction across different professional cultures and languages results in the construction of common ground (Klein, 2014). The two faculty members also provided feedback.

**Stage five: Written case study.** To meet student learning outcomes, student groups reflected on their case presentation and utilized feedback to revise their case study and analysis to develop a final written case study for faculty review and grading. At this stage, faculty primarily assessed how well student groups incorporated feedback from the instructors and peers to enhance their overall case study and analysis. Table 1 provides information from the example case with peer-review comments and application to the final written case study.

## Results

Completion of the student-designed case study activity provided students with an opportunity to examine several facets of IPE with realistic problem solving. The results of this learning activity are presented in the framework from Barr's model of key competencies for IPE (Barr, 1998). These findings were summarized from comments from students in the class, the review by the two co-facilitators, and the example student-designed case (Figure 2).

### Recognize and Respect the Roles of Other Professions

Working closely with others from disciplines outside of their own allowed students to learn more about problems that spanned multiple fields and occupations. In the example case, students with backgrounds in kinesiology and speech language pathology discovered a shared interest in the awareness of diagnosis, treatment, and recovery from concussion. Though this topic exists as a health promotion priority, examining a case from different perspectives helped illustrate the wide scope of underlying issues within one case scenario. The students additionally identified concerns crossing several disciplines that included health care professionals, members of administration within the law enforcement community, and human resource representatives in order to meet the medical and employment concerns of the patient and his wife. Issues that surfaced included interpersonal communication and the individual mental or psychological beliefs regarding concussion as a traumatic brain injury. The education that occurred with the law enforcement personnel led to an internal policy review and additional training for officers. Students

Table 1  
*Select Feedback and Group Response on the Example Case and Analysis*

Review Criteria	Self-assessment of 1 <sup>st</sup> Case Presentation: Oral	Peer-Review Feedback	Student Use of Feedback for Case Presentation: Final Paper
Identify Problem and Underlying Issues	<ul style="list-style-type: none"> <li>Presented problematic issues from ED staff, PCP and patient perspective</li> </ul>	<ul style="list-style-type: none"> <li>Clear, realistic description of case</li> <li>Difficult to keep track of stakeholders</li> <li>Need more focus on conceptual background</li> </ul>	<ul style="list-style-type: none"> <li>Maintained realism of case</li> <li>Expanded focus to organizational infrastructure and leadership issues</li> <li>Elaborated on conceptual framework</li> </ul>
Inference of Data for Decision-making	<ul style="list-style-type: none"> <li>Evidence related to healthcare only</li> </ul>	<ul style="list-style-type: none"> <li>Clear, empirical supporting evidence</li> <li>Need more examples of proposed solutions from the literature</li> </ul>	<ul style="list-style-type: none"> <li>Expanded solutions to utilize communication methods from aviation and the Navy</li> </ul>
Use of Health Measurements to Achieve Goals	<ul style="list-style-type: none"> <li>Proposed follow-up 48 hours after discharge from ED</li> <li>Focused measurement on staff level communication and hand-off issues</li> </ul>	<ul style="list-style-type: none"> <li>Need recommendations and evidence to be more integrated</li> <li>Need to apply current models and trainings to case</li> <li>Consider care pathway in ED instead of follow-up 48 hours after visit</li> <li>Consider culture changes rather than individual changes</li> </ul>	<ul style="list-style-type: none"> <li>Incorporated additional training and expanded explanations of models</li> <li>Modified recommendation from follow-up to care pathway development</li> <li>Focused development of solutions at the organizational/leadership level and staff level</li> </ul>
Interprofessional Focus of Case Analysis	<ul style="list-style-type: none"> <li>Case spanned 3 different settings: emergency department, primary care and word setting</li> </ul>	<ul style="list-style-type: none"> <li>Great diversity of stakeholders</li> <li>Consider expanding individual patient view of interprofessional care</li> <li>Appreciated conclusions targeting several disciplines</li> </ul>	<ul style="list-style-type: none"> <li>Expanded the interprofessional focus through creation of working group comprised of organizational leadership, staff and PCP representatives</li> </ul>

reported understanding the differences between multiple disciplinary perspectives more clearly, even though those differences may be nuanced and not explicit. They emphasized the importance of respectful communication and environments that valued collaboration.

### Jointly Plan and Review Care Interventions

Many over-arching problems facing society today compel investigators to examine data from multiple disciplines to make effective decisions. In this project, the shared process of examining scholarly literature

exposed students to new types and sources of data, including theoretical and empirical research. This provided students with a different foundation to draw upon when developing recommendations for their analysis. As such, collaborative practice may assist with reviewing care processes. For instance, in the example case students identified potential benefits from improving communication through standardized reporting mechanisms. A lack of structured communication strategies could have cumulative effects on professionals outside of their immediate setting and impact outcomes. The case analysis included planning

to enhance communication by outlining action steps based on literature and existing practices.

### Evaluate the Outcomes of Another Practitioner's Work

Commonly, a first step was to develop consensus on the focus of their desired outcomes and measurement goals. In the example case, the students prioritized four domains in the case for measurement: inter-professional collaboration, communication, transition in care, and patient satisfaction. They selected assessment tools for each domain noting explanations and critique of these choices in their case presentation and final written report. The list of evaluation measures students proposed reflected a wider range of tools than expected from a narrower scope of discussion. During the presentation, other student colleagues shared their own findings from the review of the literature from different professions.

### Facilitation of Inter-professional Case Conferences and Team-working

During case development the students incorporated perspectives from different disciplines by describing the actions of several individuals in the case. One benefit from working in small groups to create this case analysis was the combining of perspectives and experiences to describe a multitude of stakeholders in the case, as well as the possibilities for inter-professional collaboration within the care plan. Blending their knowledge and experiences opened the door to identifying potential shortcomings or strengths of treatment approaches illustrated in the case. In the example case, students applied their knowledge gains about inter-professional approaches to health promotion and exemplified the need for collaboration between professionals from diverse fields to solve complex problems. Though this case highlighted health care provided to a single person, the students also realized health promotion efforts using interprofessional approaches might show significant benefits with broader impact.

### Lessons Learned

Through this activity, student experiences can be tied to the literature of teaching and learning.

**Use case study design to promote inter-professional interaction in a new way.** For this project, the object achieved was collaborative practice through a mediating step of case design. We raised the level of expectations by requiring that students work in small groups to design a case for the primary goal of gaining knowledge of other disciplines, communication skills, and appreciation for interprofessional collaboration.

Reeves and colleagues suggested that scheduling time for interaction was a responsibility of the IPE planner (Reeves, Goldman & Oandasan, 2007). Consistent with a constructivist approach to teaching and learning, student interaction through informal exchanges was a significant component of the learning process as they developed real-world problem-solving skills (Dirkx, 2001; Mann, 2004). As a benefit of social learning, the planning for this case-based activity aimed for the groups to achieve more by working together than they could have in individual efforts (Salomon & Perkins, 1998).

**Prepare students to think critically.** Two important considerations for future application of this activity include: (1) building a framework that promotes student exchange, application, and refinement of knowledge; and (2) balancing opportunities for student engagement within a set timeline (Bhagal et al., 2011). In addition to cognitive benefits, improved social dimensions of learning, such as communication and interpersonal skills, were observed. These skills may support collaborative discussions for effective application of empirical evidence to cases (Koh, Khoo, Wong, & Koh, 2008). A practical example of how we applied this was in grading the final written report. We sought evidence that students considered the peer-review feedback as an indicator of their responsiveness to areas that needed further elaboration and clarification in their revised paper. This was a significant component of their grade.

**Make the case for inter-professional collaboration, challenges and opportunities.** When beginning this activity, we provided students with general descriptions about inter-professional collaboration and asked them to discuss the challenges and opportunities they experienced when multiple disciplines shared knowledge and perspectives to solve problems. Several students commented on inhibitors, such as those reported by Reeves and colleagues (2007), from gaps in supervisor comfort with IPE to organizational structures and external factors. The processes of developing professional identity and cultures could influence attitudes about IPE (Hall, 2005; Mitchell, Parker & Giles, 2011). Peer feedback indicated that the case studies showed interprofessional practice and education as a complex and valuable strategy to improving health outcomes.

**See problems through the eyes of another.** As students collaborated on case design, differences in their professional preparation and perspectives emerged. Preformed stereotypes about professional identity could signal a need for consensus-building to describe a case scenario that seems realistic to different disciplines. Also, students discovered the development of their scenario could quickly snowball, and they faced the challenge of leaving out discipline-related teaching points to keep the case scope manageable (WHO, 2010). A critical skill for PBL is defining the problem and working with students of other disciplines, thus

requiring students to transfer their problem-solving strategies in new ways (Hmelo-Silver, 2004).

We also learned that we needed specifically to encourage students to do crosschecks on their communication, such as jargon use and assumptions about the meanings of conversations (Casimiro et al., 2009). As noted by Pippa Hall in her paper on interprofessional teamwork and professional culture, it is important to ask, “[D]o you see what I see?” (2005, p. 190). Students commented positively about the process of becoming open to forming a shared understanding of issues and considering different strengths and limitations of potential solutions. A benefit of the knowledge translation process is the focus on seeing gaps in care as others see them in order to identify effective practice changes (Graham et al., 2006).

**Question assumptions about how to measure outcomes.** While the students could easily agree on goals to resolve their case problem, this instructional activity required more attention to identifying and justifying measurement tools than they anticipated. Selection of measurement tools provided a meaningful avenue for collaboration to devise a plan for assessment and decision-making (Barr, 1998). Students needed to infer the nature of the data required to develop multiple solutions and evaluate the potential pros and cons based on evidence. However, students may be more comfortable when asked to apply deductive reasoning in a guided experience to resolve an assigned case problem. By accepting different disciplinary perspectives from the start, students may take additional steps to develop a flexible knowledge base and effective problem-solving skills (Hmelo-Silver, 2004).

Secondly, students needed to develop a process for evaluating measurements found in the literature and public domain to narrow down a list of appropriate tools. Students received information about measurement selection through lecture, course readings, and discussion that they drew upon to select the health measurements that fit their case studies. Student development of skills with collaborative decision making to measure outcomes can contribute to positive health and system outcomes to meet the objectives of IPE (IOM, 2015).

Third, students needed to develop their priority measures and maintain a realistic measurement set to apply in a real-world situation. Peer feedback and class discussions helped students develop plans for monitoring and evaluation. For the case example illustrated here, students appreciated issues from a system/administration level and then focused on shortcomings in policy that may lead to improved collaborative practice. These factors reinforced that professionals should collaborate in the evaluation of variables to measure outcomes for complex problems in a practice setting.

### **Share perspective through constructive feedback.**

Providing peer review represented a quandary for the students. On one hand, students struggled with giving classmates constructive comments. On the other hand, students really wanted the feedback their peers provided. Another option would be to use a blind process. As noted in a study of a doctoral nursing program by Sethares and Morris (2016), students typically lack experience with peer review and struggle to give constructive comments. However, students recognized that constructive criticism and negotiating of opinion led to informed discussion and important reflection given the complexities of interprofessional practice (Kuziemsky & Varpio, 2011).

## **Discussion**

The structure of this learning activity successfully aligned with IPE guidelines from the WHO to allow students from a variety of disciplines to learn with each other to develop collaborative practices and improve health outcomes (WHO, 2010). Students demonstrated the intended learning outcomes as they collaborated on describing, researching, evaluating, and making recommendations to solve complex problems. They exchanged information from their own disciplines within their groups and presented information for classmates’ peer review.

The framework of the assignment provided an opportunity to “deliberatively work together” to improve community and population health care systems (IPEC, 2016). Also, this student-designed case activity incorporated students’ active engagement to enhance knowledge, skills, and attitudes about interprofessional collaboration in a manner that may support practice improvements (Bhagal et al., 2011; Loyens et al., 2015). Efforts by the Canadian Interprofessional Health Collaborative emphasizes knowledge transfer as a key component of interprofessional education and collaborative practice to improve health systems (CIHC, 2009).

Combining students from different professions in the student-designed case study process supported a structured opportunity for socio-cultural learning, which is considered key to interprofessional learning (Freeth et al., 2002). Since students self-selected their group members, they freely combined forces and infused individual interest areas into the case without instructor influence. There was no indication that the combination of disciplines participating and potentially benefitting from this learning activity is limited to predetermined options. The tenets of expansive learning may be applied to this learning activity, also. By students needing to design and make recommendations to solve a problem with awareness of the perspective of other fields, they began questioning disciplinary wisdom and could move from abstract to concrete learning actions (Engeström & Sannino, 2010). These



processes may enable students to continue efforts to meet IPE goals to cross-disciplinary boundaries and build more effective networks.

As noted by Choi and Pak, the objective of interdisciplinary approaches is to resolve real world or complex problems using the different perspectives of various disciplines (2006). The literature on “learning transfer” highlights benefits from students working through multiple cases and instructor cueing (Speicher, Bell, Kehrhahn, & Casa, 2014). As students actively engaged in critiquing other cases and responded to instructor and peer feedback in the iterative process of this IPE case study activity, they may have become more proficient at problem solving. Another consideration is the complex concept theory as described by Szostak (2014). Our case study activity encourages students to explore complex problems from different perspectives. This process of analyzing complex problems may be similar to breaking down complex concepts into combinations of more basic concepts (Szostak, 2014).

With this case study we aimed to provide opportunities for students to develop real-world problem-solving skills as described in the literature (Dirkx, 2001; Mann, 2004). As we implemented exchange-based learning through case study and problem solving, these students learned about both similarities and differences in others’ roles (Barr, 1996). Our findings are limited to short-term results and limited application of this course assignment at NIU. We encourage other instructors to consider the challenge of leaving the case design up to the students and support an interprofessional learning environment.

### Implications

Through the development and analysis of a case study, educators can apply a problem-based learning approach with instructor guidance and peer feedback that may be well received by the students. While the assignment’s five-stage process allowed for progressive building of skill levels, others could apply the premise with shortened stages in another setting or with revised student learning outcomes. The student-designed case study promoted collaborative practice between students through formal and informal interactions. As identified by others, the constructivist framework lends itself to IPE as an interactive and socialization process (Casmiro et al., 2009; Olenick et al., 2010).

Key features to consider include the dialogue, planning, and critique among classmates. First, collaboration occurs in the small groups in order to design a case and to allow inter-professional perspectives to emerge. In addition, the collaboration allows for the exploration of problems, measuring tools, and solutions from different disciplinary views to

enhance the graduate students’ application of research to practice. The practice of giving and receiving feedback from other disciplines can add another dimension to understanding the dynamics of inter-professional collaboration. The learning process for this activity could contribute to the development of real-world problem-solving skills.

### Conclusion

This student-designed case study activity allowed students to develop collaborative competencies and to practice application of research and theory to a complex problem. Reflection on Barr’s model of competency-based interprofessional education, the social-participatory learning process, and the IPE literature provided guidance for course planning. Such problem-based learning activities may support students working together and learning from each other to reach the next area of potential development that extends beyond disciplinary formation. Through interprofessional collaboration, small groups of students from different disciplines developed strategies for planning, implementing, monitoring, and evaluating a health program. Increasing student confidence with solving complex problems through collaboration in case design may enhance later skills with collaborative practice to improve health outcomes.

### References

- Barr, H. (1996). Means and ends in interprofessional education: Towards a typology. *Education for Health, 2*(2), 341-352.
- Barr, H. (1998). Competent to collaborate: Towards a competency-based model for interprofessional education. *Journal of Interprofessional Care, 12*, 181-187. doi:10.3109/13561829809014104
- Barr, H. (2002). *Interprofessional education: Today, yesterday and tomorrow*. London, UK: LTSN for Health Sciences and Practice. doi:10.1002/9781118410868
- Bhagal, S. K., Murray, M. A., McLeod, K. M., Bergen, A., Bath, B., Menon, A., Kho, M. E., & Stacey, D. (2011). Using problem-based case studies to learn about knowledge translation interventions: An inside perspective. *Journal of Continuing Education in the Health Professional, 31*, 268-275. doi:10.1002/chp.20140
- Canadian Interprofessional Health Collaborative (CIHC). (2009). *Stronger together: collaborations for system-wide change*. Retrieved from [http://www.chic.ca/files/partnerships/CIHC\\_KESStrategy.Jan09.pdf](http://www.chic.ca/files/partnerships/CIHC_KESStrategy.Jan09.pdf)
- Canadian Interprofessional Health Collaborative (CIHC). (2010). *A national interprofessional*

- competency framework*. Retrieved from [http://www.cihc.ca/files/CIHC\\_IPCompetencies\\_Feb1210.pdf](http://www.cihc.ca/files/CIHC_IPCompetencies_Feb1210.pdf)
- Casmiro, L., MacDonal, C. J., Thompson, T. L., & Stodel, E. J. (2009). Grounding theories of W(e)Learn: A framework for online interprofessional education. *Journal of Interprofessional Care, 23*, 390-400. doi:10.1080/13561820902744098
- Chaiklin, S. (2003). The zone of proximal development in Vygotsky's analysis of learning and instruction. In A. Kozulin (Ed.), *Vygotsky's educational theory in the cultural context* (pp. 39-55). Cambridge, MA: Cambridge Press.
- Choi, B. C., & Pak, A. W. (2006). Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness. *Clinical Investigations in Medicine, 29*(6), 351-64.
- Dirkx, J. M. (2001). The power of feelings: Emotion, imagination, and the construction of meaning in adult learning. In S. B. Merrimam (Ed.) *New directions for adult and continuing education: The new update on Adult Learning Theory* (pp. 63-72). San Francisco, CA: Jossey-Bass.
- Dolmans, D., Michaelsen, L., Van Merriënboer, J., & van der Vleuten, C. (2015). Should we choose between problem-based learning and team-based learning? No, combine the best of both worlds! *Medical Teacher, 37*(4), 354-359. doi:10.3109/0142159X.2014.948828
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review, 5*(1), 1-24. doi:10.1016/j.edurev.2009.12.002
- Freeth, D., Hammick, M., Koppel, I., Reeves, S., & Barr H. (2002). *A critical review of evaluations of interprofessional education*. London, UK: LTSN for Health Sciences and Practice.
- Gambescia, S. F. (2017). Message from the editor in chief: Health education specialists and the interprofessional education movement. *Pedagogy in Health Promotion, 3*, 75-76.
- Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Terteo, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education of Health Professions, 26*, 13-24. doi:10.1002/chp.47
- Hall, P. (2005). Interprofessional teamwork: Professional cultures as barriers. *Journal of Interprofessional Care, 19*, 188-196. doi:10.1080/13561820500081745
- Hall, P., & Weaver, L. (2001). Interdisciplinary education and teamwork: A long and winding road. *Medical Education, 35*(9), 867-75.
- Hammick, M., Freeth, D., Copperman, J., & Goodson, D. (2009). *Being Interprofessional*. Cambridge, UK: Polity Press.
- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235-266.
- Institute of Medicine (IOM). (2013). *Interprofessional education for collaboration: Learning how to improve health from interprofessional models across the continuum of education to practice: Workshop summary*. Washington, DC: National Academies Press.
- Institute of Medicine (IOM). (2015). *Measuring the impact of interprofessional education on collaborative practice and patient outcomes*. Washington, DC: National Academies Press.
- Interprofessional Education Collaborative Expert Panel (IPEC). (2011). *Core competencies for interprofessional collaborative practice: Report of an expert panel*. Washington, DC: IPEC.
- Interprofessional Education Collaborative Expert Panel (IPEC). (2016). *Core competencies for interprofessional collaborative practice: 2016 update*. Retrieved from [https://ipecollaborative.org/uploads/IPEC-2016-Updated-Core-Competencies-Report\\_final\\_release\\_PDF](https://ipecollaborative.org/uploads/IPEC-2016-Updated-Core-Competencies-Report_final_release_PDF)
- Klein, J. T. (2014). Communication and collaboration in interdisciplinary research. In M. O'Rourke, S. Crowley, S. D. Eigenbrode, & J. D. Wuffhorst (Eds.), *Enhancing communication and collaboration in interdisciplinary research* (pp. 11-33). Thousand Oaks: CA: Sage Publishing.
- Koh, G. C-H., Khoo, H. E., Wong, M. L., & Koh, D. (2008). The effects problem-based learning during medical school on physician competency: A systematic review. *Canadian Medical Association Journal, 178*(1), 34-41.
- Kuziemy, C. E., & Varpio, L. (2011). A model of awareness to enhance our understanding of interprofessional collaborative care delivery and health information system design to support it. *International Journal of Medical Informatics, 80*(8), 150-160. doi:10.1016/j.ijmedinf/2011.01.009
- Loyens, S. M. M., Jones, S. H., Mikkers, J., & Van Gog, T. (2015). Problem-based learning as a facilitator of conceptual change. *Learning and Instruction, 38*, 34-42. doi:10.1016/j.learninstruc.2015.03.002
- Mann, K. V. (2004). The role of education theory in continuing medical education: Has it helped us? *The Journal of Continuing Education in the Health Professions, 24*, S22-S30. doi:10.1002/chp.1340240505

- Messikomer, C.M., & Cirka, C.C. (2008). Managing everyday ethics in assisted living: A research-based case analysis for the classroom. *Gerontology & Geriatrics Education*, 28, 71-93. doi:10.1080/02701960801963201
- Mitchell, R. J., Parker, V., & Giles, M. (2011). When do interprofessional teams succeed? Investigating the moderating roles of team and professional identity in interprofessional effectiveness. *Human Relations*, 64, 1321-1343.
- Nalliah, S., & Idris, N. (2014). Applying the learning theories to medical education: A commentary. *International e-journal of Science, Medicine, & Education*, 8, 50-57.
- Olenick, M., Allen, L. R., & Smego, R. A. (2010). Interprofessional education: A concept analysis. *Advances in Medical Education and Practice*, 1, 75-84. doi:10.2147/AMEP.S13207
- Reeves, S. R., Goldman, J., & Oandasan, I. (2007). Key factors in planning and implementing interprofessional education in health care settings. *Journal of Allied Health*, 36, 231-235.
- Salomon, G., & Perkins, D. N. (1998). Individual and social aspects of learning. *Review of Research in Education*, 23, 1-24.
- Sethares, K. A., & Morris, N. S. (2016). Learning about and benefiting from peer review: A course assignment for doctoral students at two different universities. *Journal of Nursing Education*, 55(6), 342-344. doi:10.3928/01484834-20160516-07
- Speicher, T., Bell, A., Kehrhn, M., & Casa, D. (2014). Effect of cueing on learning transfer among health profession students engaged in a case-based analogical reasoning exercise. *The Internet Journal of Allied Health Sciences and Practice*, 12(3), 1-9.
- Szostak, R. (2014). Communicating complex concepts. In M. O'Rourke, S. Crowley, S. D. Eigenbrode, & J. D. Wuffhorst (Eds.), *Enhancing communication and collaboration in interdisciplinary research* (pp. 34-55). Thousand Oaks: CA: Sage Publishing.
- Vygotsky, L. S. (1978). Interaction between learning and development (M. Lopez-Morillas, Trans.). In M. Cole, V. John-Steiner, S. Scribner, & E. Soubberman (Eds.), *Mind in society: The development of higher psychological processes* (pp. 79-91). Cambridge, MA: Harvard University Press.
- Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Upper Saddle River, NJ/Alexandria, VA: Pearson Education/Association for Supervision & Curriculum Development.
- World Health Organization (WHO). (2010). *Framework for action on interprofessional education and collaborative practice*. Retrieved from [http://www.who.int/hrh/resources/framework\\_action/en/](http://www.who.int/hrh/resources/framework_action/en/)

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