# Case-Based Interprofessional Learning to Increase Health Professions Students' Perceptions of Communication and Teamwork


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**Abstract** The Interprofessional Education Collaborative (IPEC) expert panel advocates for health profession students to learn to work together. This study examined the impact of the IPE case-based experience on health profession students. The exercise was a single IPE case-based learning in which students representing three health disciplines described and reflected the specific teamwork and communication skills needed to work effectively on an interprofessional health care team. The study used a mixed-method design with a concurrent approach. A quasi-experimental pretest–post-test design using the communication construct of the TeamSTEPPS™ Teamwork Attitudes Questionnaire (T-TAQ) was implemented. Qualitative phenomenology methods were used to gather feedback from participants about the learning activity. A total of 191 Undergraduate Medicine, Midwifery, and Pharmacy Study Program students who participated in the activity completed pre- and post-test questionnaires. A paired sample t-test was employed. There was an increase in scores on all subscales of the T-TAQ instrument ($p < 0.05$). The students mentioned that the program enabled interactivity and engagement. Moreover, the participants understood teamwork and communication in healthcare and the other professions' roles. These findings suggest that a case-based IPE forum is achievable and can effectively introduce students to other health science professions, increase perceptions of collaboration and teamwork, and increase understanding of the need for interprofessional communication.

**Keywords** Interprofessional education · Case-based learning · Communication · Teamwork

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## List of Abbreviations

| | |
|---|---|
| IPEC | Interprofessional Education Collaborative (IPEC) |
| T-TAQ | TeamSTEPPS™ Teamwork Attitudes Questionnaire |
| IPE/L | Interprofessional Education/Learning |
| CBD | Case-based discussion |
| WHO | World Health Organization |

## 1 Introduction

The healthcare system is challenged by many problems and demands, such as lack of human resources, the burden of health care costs, and lack of collaboration, communication, and respect between health professionals [1–3]. The healthcare system consists of multiple specific health professions with complex workloads, which require multiple health professionals to work together as a unit [4]. Interprofessional teamwork can improve health outcomes, increase patient safety, suppress the length of hospital stay, reduce medical errors, optimize patient satisfaction, improve patient safety, and achieve better health outcomes [5, 6]. Therefore, students need to be exposed early to interprofessional education in undergraduate programs [6]. Furthermore, the World Health Organization (WHO) suggested an innovative strategy to overcome the global health workforce crisis by maximizing interprofessional collaboration in educational programs and clinical practices [7].

Designing interprofessional education (IPE) learning requires integrated models customized to the demands of clinical practice in the future. The old curriculums for healthcare professions were usually created for their professions, so innovation is needed to keep IPE learning still related to their professions and in accordance with their curriculum [1]. Many factors need to be considered to design IPE learning, such as time adjustment between many study programs, lack of resources, limited time and budget, different cultures, and specific requirements from each profession [2, 8]. Lack of learning preparation and planning will affect the stability of the curriculum and the inability to achieve learning objectives [8]. IPE learning needs innovative activities other than traditional one-way lectures to be effective and achieve its goal [9]. Abdelaziz et al. suggested several methods, including case-based learning and action-based learning using the problem-based case method [10].

Case-based learning (CBL) is a student-centered learning technique that encourages students to apply knowledge concepts, uses higher-order thinking abilities, and learn important skills such as decision-making and critical thinking, to solve problems in real practice [11–14]. CBL is applied in different health educations, such as medicine, dentistry, nursery, pharmacy, nutrition, physiotherapy, occupational therapy, and interprofessional programs. CBL can also be used in many different levels of education, from undergraduate students to postgraduate and residency programs [11]. CBL has also proven effective in achieving IPE learning objectives,

especially in understanding each profession's role and improving awareness of their value to each other [13, 15].

The Coronavirus Disease 2019 (COVID-19) pandemic impacted many sectors, including education. Virtual learning became a common activity during the pandemic. However, many challenges occurred, such as fewer effective interactions in class, lack of better understanding of technology and software, ineffective communication between students and their lecturers, higher costs, and it became harder to adjust timetables from different study programs [16]. Virtual learning also made practical learning and hands-on learning harder to achieve, and it was challenging to keep active participation from students with different backgrounds [10]. The complexity of IPE curriculum design, different backgrounds, and attitudes also became a challenge in implementing IPE during pandemics. However, IPE still needs to be implemented considering the importance of enriching interprofessional collaboration, especially during the pandemic [16]. With the growth of virtual learning during the COVID-19 pandemic, especially in the medical and health profession education context, it is essential to explore opportunities for students from different health disciplines to learn together. Although several researchers have evaluated the effectiveness of IPE programs conducted through traditional on-campus courses, there are relatively limited studies evaluating the implementation of online interprofessional learning (IPL). This study used a mixed-methods design to evaluate the effectiveness of online CBL IPE on communication and teamwork competencies among healthcare students.

## 2 Methods

a. Participants and Study Design

   A total of 304 students enrolled in an undergraduate healthcare institution focused on IPE/L were invited to participate in the study. Focusing on undergraduate healthcare students was crucial because most of their education/training occurred in silos with limited opportunities to collaborate with students from different health professions. A mixed methodology with a concurrent approach was implemented. The results were analyzed both quantitatively and qualitatively. This study provided a direct understanding of students' experiences with communication and teamwork since they learned in interprofessional teams. Students were invited to participate in the study during the IPL session and were provided the link to an online survey on Google Forms with Likert scales and free-text answers.

b. Description of the IPE Program

   The IPL workshop was designed and co-delivered by academics from the School of Medicine, the Pharmacy School, and the Midwifery School, Universitas Sebelas Maret, Indonesia. The course was scheduled for three hours and consisted of three one hour sessions with academic-led material, case-based discussion,

and presentation and feedback. The taught topics were delivered to the entire students from three schools and included: (1) defining IPL and (2) the role of health professional students during the COVID-19 pandemic. After that, a series of breakout sessions were conducted using the Zoom platform (Zoom Video Communications, Inc.), where students from three disciplines worked in groups of 10–11 students. There were 28 breakout rooms divided into two different schedules—14 groups each, supervised by four academic staff. Each group had to discuss a case study and four following discussion questions adapted from https://www.northeastern.edu/oralhealth/toolkit/6-case-based-learning/session-2-teamwork-and-communication-in-health-care/. The case study and questions focused on scenarios discussing the roles of the health professions, teamwork, and communication of topics where healthcare providers from different disciplines worked as a team. Students discussed the case and questions via Zoom meetings and then submitted their written responses to discussion questions via the university's online learning management system. Students could communicate with facilitators throughout the entire session using the chat function. After finishing the breakout session, students returned to the main room to present their discussion results and discuss them with the other groups. Each group received feedback from their peers and the facilitators. Figure 1 shows the process of this study.

c. Quantitative Study

This study used pre- and post-test methodology to assess the impact of the IPE course. All the students were required to complete a survey/questionnaire adapted from the *TeamSTEPPS™ Teamwork Attitudes Questionnaire (T-TAQ)* [17] prior to the beginning and after finishing the IPE course. The data analysis program SPSS 25.0 for Windows (IBM Corp., Armonk, NY, USA) was applied for storing data and analysis. Descriptive statistics were used to examine demographic data. For all the *TeamSTEPPS™ Teamwork Attitudes Questionnaire (T-TAQ)* subscales, items were totaled, and scores were calculated. The Wilcoxon test was conducted to compare pre-test and post-test scores. Because

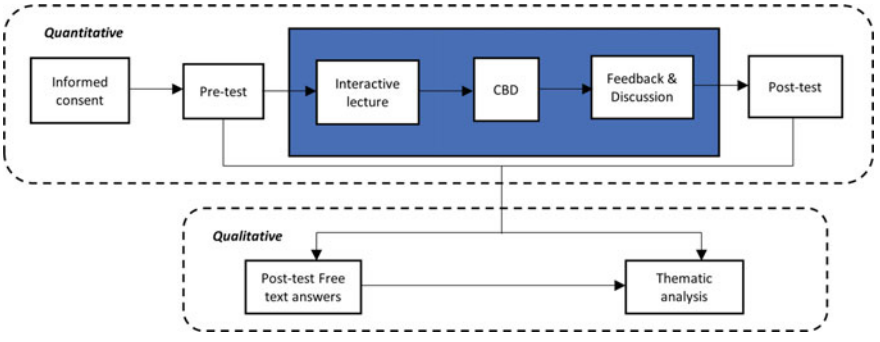


**Fig. 1** Study flow diagram

the study population was small, there was not always statistical significance. The number of respondents from each question's pre-test and post-test scores have been determined and compared in calculating variation.

d. Qualitative Study

Descriptive Qualitative analysis was completed to analyze students' responses recorded after the IPE program. The free-text answers were analyzed using thematic analysis. The steps were as follows: the researchers individually read the data several times for familiarity and produced initial codes; the codes were then compiled to form initial themes. Two researchers then reviewed the themes, and finally, the themes were refined and agreed on collectively to produce the thematic analysis. This process was conducted to ensure triangulation.

## 3 Results

a. Results of Survey

A total of 191 students completed all pre-and post-test questionnaires. Table 1 shows the number of students from each profession enrolled in the course and the questionnaire respondents. The number of students enrolled in the course was dominated by students from the School of Medicine (210 of 304). The response rates ranged between 22.92% and 70.47%, with midwifery having the lowest rate and medicine having the highest. Approximately 76% of the respondents were females. Results of the T-TAQ scores demonstrated significant differences in pre- and post-test scores among the medical and midwifery respondents. However, there was no significant difference in the scores of pharmacy participants. Table 2 shows the results of T-TAQ scores of each discipline. The T-TAQ pre-test score ranged between $23.58 \pm 2.22$ and $24.7 \pm 2.50$, with midwifery scoring the lowest among the other education program and medicine scoring the highest. The T-TAQ post-test scores ranged between $25.38 \pm 3.41$ and $25.56 \pm 2.15$, similar to the pre-test scores. There were improvements in all discipline groups.

Table 3 shows the pre-test and post-test scores for each subscale of T-TAQ. It illustrates that all T-TAQ statements had significant differences. The highest difference was in the fourth subscale, "I prefer to work with team members who

**Table 1** Number of students from each profession in the sample

| Study program | N students enrolled in the course | N respondents (% response rate for the profession) | The % response rate of the total sample |
|---|---|---|---|
| Midwifery | 48 | 11 (22.92) | 77.5 |
| Pharmacy | 49 | 32 (65.30) | 16.7 |
| Medicine | 210 | 148 (70.47) | 5.8 |
| Total | 304 | 191 (62.6) | 100 |

**Table 2** Comparison of T-TAQ overall scores

| Education program (n) | Pre-test scores (Mean ± SD) | Post-test scores (Mean ± SD) | *p*-value |
|---|---|---|---|
| Overall (191) | 24.49 ± 2.50 | 25.37 ± 2.33 | 0.000* |
| Medicine (148) | 24.7 ± 2.50 | 25.56 ± 2.15 | 0.000* |
| Pharmacy (32) | 23.88 ± 2.45 | 24.50 ± 2.49 | 0.132 |
| Midwifery (11) | 23.58 ± 2.22 | 25.38 ± 3.41 | 0.027* |

*SD* Standard deviation; *T-TAQ* Team STEPPS™ teamwork attitudes questionnaire; * significant

ask questions about the information I provide". Meanwhile, since it is a negative statement, the sixth subscale score decreased from pre-test to post-test.

b. Thematic Analysis of Free-text Answers

To evaluate the CBL and to have a deeper understanding of what students learned from and taught each other, a thematic analysis was directed toward the answers to the free-text questions: "What aspect of this interprofessional education session was most valuable to you?"; "What would you change in this interprofessional education session that would have made it more valuable to you?"; and "What follow-up activities or next steps do you see as a result of this interprofessional education session?".

Responses were analyzed and common themes were generated between the three questions. The three most dominant themes were as follows:

1. The roles of CBL in promoting cohesion and communication within the group;

**Table 3** Comparison of T-TAQ sub-scales score

| Sub-scale | Pre-test scores (Mean ± SD) | Post-test scores (Mean ± SD) | *p*-value |
|---|---|---|---|
| 1. Teams that do not communicate effectively significantly increase their risk of committing errors | 4.64 ± 0.69 | 4.85 ± 0.39 | 0.00* |
| 2. Poor communication is the most common cause of reported errors | 4.65 ± 0.58 | 4.82 ± 0.46 | 0.00* |
| 3. Adverse events may be reduced by maintaining an information exchange with patients and their families | 4.65 ± 0.52 | 4.79 ± 0.43 | 0.00* |
| 4. I prefer to work with team members who ask questions about the information I provide | 3.77 ± 0.83 | 4.14 ± 0.89 | 0.00* |
| 5. It is important to have a standardized method for sharing information when handing off patient | 4.57 ± 0.62 | 4.74 ± 0.56 | 0.00* |
| 6. It is nearly impossible to train individuals how to be better communicators | 2.20 ± 1.17 | 2.04 ± 1.40 | 0.03* |

*SD* Standard deviation, *T-TAQ* Team STEPPS™ teamwork attitudes questionnaire; * significant

2. The CBL session was effective, yet it needs some improvement in virtual technical detail; and
3. CBL can increase awareness of collaboration in achieving effective healthcare.

**Theme 1: The roles of CBL in promoting cohesion and communication within the group**

Most respondents stated that CBL promotes cohesion and communication among the group. Comments included:

> The case studies are given to be discussed by each group train students from different professions in communicating (expressing opinions) about the patient's handling in the case.

> (The most meaningful aspect is) the aspect of exchanging ideas on a given case, because it is undeniable that everyone has a different perspective that we don't think of ourselves.

> (The most meaningful aspect is) when discussing together in the breakout room, it can train communication between students.

The other respondents described that the discussion allowed them to share opinions within and with the other groups.

> In my opinion, the joint discussion taught me to share opinions and communicate with others, then during the presentation session it also made me know the views of other groups that had not been discussed in my group.

**Theme 2: The CBL session was effective, yet it needs some improvement in virtual technical detail**

The majority of the respondents described that the CBL session was very valuable. However, some respondents stated that several technical details need to be improved, such as time for discussion and breakout room technique.

> This learning has been good, both from lecturers and students. The existence of a general discussion forum from various groups makes insight more open and becomes a material for self-evaluation for the future to be more critical. It's been very good with the discussion and presentation so that you can understand more about what will be done in the future.

> The concept of learning is good enough which can encourage students to discuss and express opinions actively, but previously there were technical problems with Zoom, so the discussion time was slightly cut off. Technically, the division of the breakout room was still not smooth, so the discussion time was cut quite a bit. It is better to be prepared to be more fluent in group discussions.

**Theme 3: CBL can increase awareness of sensitivity to the problem of patients and team, the need for reflection, and the importance of teamwork collaboration in achieving effective healthcare**

Students recognized the effect of CBL in improving sensitivity to the problem of patients and team, awareness of the need for reflection, and understanding of the importance of teamwork.

> From this lesson, we can understand how important inter-professional collaboration is to be able to heal patients.
>
> Students better understand the importance of effective communication and interprofessional cooperation. The follow-up that needs to be done is that students need to learn more about how to communicate well and understand the role of each profession.
>
> (need to) learn to be more sensitive and to lower ego for mutual benefit. Self-introspection, self-reflection to find out if I am worthy of working in a team in handling cases and becoming a better communicator.

## 4 Discussions

This study sought to determine the impact of online interprofessional learning (IPL) using case-based discussion (CBD). The course needed students to collaboratively discuss with each health profession student and aimed to increase awareness and understanding of the need for communication and teamwork in healthcare. The use of a mixed-methods design may report the questions 'who' and 'how' of an IPE intervention and its results.

Interprofessional collaborative health services have been proven to increase patient safety and health outcomes. Effective IPL necessitates all students to learn with and from one another. The learning could be optimized by providing relevant context in which student will apply their knowledge [18]. In this study, academics from all schools actively designed and implemented the course to ensure the requirements of all disciplines were met. The scenario case study provided opportunities for collaborative healthcare practices, which exemplify where different professional backgrounds need to work together to conduct health services. Other studies also have shown that student collaborative working using CBD can help to promote positive attitudes toward interprofessional collaboration [19, 20].

Previous work showed that setting for learning is essential [18]. Ideally, the experience of interprofessional collaboration is conducted face-to-face either on campus, in a hospital, or a community setting. However, the COVID-19 pandemic forced the implementation of education to become virtual. Interprofessional competence must still be taught in all of its complexity. Therefore, it is necessary to modify learning so that communication skills and interprofessional cooperation are still achieved. Online learning provides an opportunity for educational programs that involve many students from various disciplines, with difficulties in scheduling and implementation, to be carried out properly. Although virtual education has been widely applied before COVID-19, e-learning in health professional education is still inconsistent [21]. A recent study suggested that the online method is well-accepted. In addition, Varvara also mentioned that, if appropriately applied, e-learning can improve the quality of education and teaching [21]. CBD topics are chosen to become part of the curriculum content of all study programs, namely child health and oral health, to make learning relevant to the entire study program. The topic was chosen based on the results of the IPE course development meeting by academics from the three disciplines.

From the survey, students have reported that online interprofessional learning encourages the achievement of learning goals. The CBD in this study involved more than 200 students from various health disciplines, and the online method successfully accommodated many participants. Feedback from respondents indicated that online CBD could facilitate interactivity and discussion. The discussion and division of small groups in breakout rooms can maximize engagement and interaction between students in the group. Previous studies reported that engagement and interaction are conditions for a successful interprofessional course [22, 23]. Furthermore, other works have reported that virtual interprofessional education has the same effect as face-to-face methods, increasing knowledge, skills, and attitudes related to teamwork [19, 24, 25]. The low response rate of midwifery respondents was because, during the post-test data collection, midwifery students had entered the midwifery practice stage at the hospital, so there was a possibility of difficulty in completing the questionnaire. However, even though the numbers were small, midwifery students' T-TAQ scores increased significantly from the pre-test to the post-test.

These T-TAQ quantitative results and the qualitative student responses provide the insight that IPE can be learned effectively online. This work is unique in that the learning was entirely online during a pandemic and involved a variety of health disciplines. The success of this study is probably because course participants only came from the three selected disciplines. Another study stated that the effectiveness of IPE could be hampered if it involves more than five health disciplines. It has been reported that reducing the number of disciplines would improve student engagement and collaborative experience [26, 27]. In addition, the success of IPE is also influenced by the relevance of the topics raised in this course. The results of the analysis showed that there was no significant increase in the T-TAQ score for pharmacy students. This is possible because there is minimal interaction with students of other professions during the learning process in the pharmacy curriculum. Although online CBD in IPE is considered beneficial, there are still challenges in the form of scheduling from multiple student disciplines to take part in the same IPE session.

Limitations

Although IPE plays a significant role in higher education, the development and implementation of its activities are resource-intensive and time-consuming. It is because IPE involves various disciplines, both academics, and students. Previous studies reported that IPE planning takes three times longer than traditional course learning planning. In addition, one of the obstacles to implementing online learning is the limited Internet connection, so a small number of students come in and out of the zoom session. This condition causes students to be frustrated and can disrupt the discussion process. The 62% of the students who completed the pre-and post-test survey are reasonable because there were no incentives given to students. Another weakness of this study is the inability to determine whether the positive effects of the implemented IPE program will be lasting. Although there were positive changes in attitudes and perceptions, it is still necessary to conduct longitudinal observations to examine whether this IPL affects interprofessional clinical practice.

## 5 Conclusions

Our findings suggested that IPE online using the CBD approach effectively enabled students from three disciplines to work together and learn from each other. There was a significant positive impact on attitudes and perceptions regarding communication and teamwork. Online interprofessional learning enables many students without being limited by room size and without the need for many parallel sessions. The online platform successfully facilitated the delivery of one scheduled session for many students, reducing the number of academics to facilitate learning, breakout groups, and discussion. Interactivity and engagement during CBD were evident, which facilitated achieving the learning outcomes.

Future works across universities are needed to explore student attitudes toward IPE. Additionally, longitudinal studies are needed to explore the impact of IPL in real work settings.

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*Neoniza Eralusi Asrini*—collected data, data analysis, and preparation for publication manuscript.

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