Journal of Multidisciplinary Healthcare

Dovepress
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ORIGINAL RESEARCH

Does Online Interprofessional Case-Based Learning Facilitate Collaborative Knowledge Construction?

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Introduction: COVID-19 pandemic has caused an impact on various sectors of life, including the education sector. During the COVID-19 pandemic, education from various levels could only be carried out online by utilizing various on-line media. In Health professional education context, one of the learning activities that must be shifted in online format was interprofessional education (IPE) program. This study aimed to evaluate students' collaborative knowledge construction to evaluate the effectiveness of online interprofessional case-based learning (CBL) activities.

Methods: This interventional study using quantitative and qualitative method involved a total of 476 students; consisted of 204 medical students, 39 midwifery students and 233 nursing students; who took part online interprofessional CBL. All students were divided into 34 mixed profession groups with 14 students each. To evaluate students' collaborative knowledge construction during CBL, data were collected using the Maastricht Peer Activity Rating Scale (MPARS). Qualitative data exploring students' perception regarding online IPE activity and their online CBL process were collected using Focus Group Discussion (FGD). Quantitative data were analysed using statistical tests, and the qualitative data were analysed using thematic analysis.

Results: Students' scores for constructive, collaborative, and motivational activities evaluated using MPARS were considered as average to high. However, nursing students scored the lowest compared to the other two fellow professions: medical and midwifery students, on all items of the MPARS. Medical students had the highest MPARS scores. Several themes could be explored during the FGD.

Discussion: This study revealed that students could engage in collaborative knowledge construction in interprofessional education implementing online interprofessional CBL. However, students thought that offline collaborative practice will better improve team bonding which is considered as prominent aspect for collaboration. This thought gives idea to the implementation of hybrid online offline learning for IPE.

Keywords: interprofessional education, IPE, case-based learning, CBL, online learning, Maastricht Peer Activity Rating Scale, MPARS

Introduction

The COVID-19 pandemic has had an impact on various sectors of life, including the education sector. During the COVID-19 pandemic, education from various levels was conducted online by utilizing various on-line media, from simple media to comprehensive model of e-learning. Medical and health professional education institutions in general had been affected by the COVID-19 pandemic and had to change their teaching and learning patterns using virtual learning or hybrid online offline learning. The choice of online learning was a mandatory and non-negotiable option so that students could continue their learning, even though they had to undergo social distancing during the pandemic. With the online learning model, students could still learn and develop knowledge and skills even though they were separated by distance and time from lecturers and from other learners.[1] It is known that health professional education requires learning activities that necessary face to face offline interaction among learners and facilitators. Learning activities that

Received: 2 October 2022
Accepted: 30 December 2022
Published: 12 January 2023

aimed students to experience the process, such as laboratory practicum, clinical skills, clinical rotations in hospitals as well as learning activities in the community are among those to be conducted offline. However, the pandemic had prevented these activities from being held offline, so adjustments need to be made so that during the pandemic, practical activities and clinical skills can still be organized in online model.

During the pandemic, one of the learning activities that need to be adjusted using online learning was interprofessional education (IPE) activities. It is known that training health professional students to work together is recognized as an important step in creating interprofessional collaboration, and IPE is globally considered as a learning approach to educate health professionals students to learn skills needed for effective interprofessional collaborative practice within increasingly complex health problems.[2] WHO, in the document of "Transforming and scaling up health professionals' education and training", emphasizes the importance of interprofessional health education (IPE) as an effort to reduce world health problems by increasing effective collaborative health care practices.[3] In general, the goal of IPE is to educate students from various health professions to work collaboratively to deliver patient-centred and evidence-based healthcare.[4] Previous studies have reported that IPE can effectively equip health workers with the attitudes, knowledge and skills needed to work effectively in collaborative healthcare practices.[5]

The Indonesian government views that interprofessional healthcare collaborative practice is an important issue in Indonesian the health care system, therefore the government provides support to the implementation of IPE. Government suggested that IPE must be mixed up in the curriculum of health professional education in Indonesia. Moreover, the implementation of IPE is also one of the education standards assessed by Indonesian Accreditation Agency for Higher Education in Health (IAAHEH). Based on these directives, all health professional education institutions are advised to implement IPE in their curriculum. However, up to the present, few health professional education institutions in Indonesia have implemented IPE due to some barriers and each institution is still looking for teaching model for IPE that can produce expected outcomes and suitable with the institutions' context.[6,7]

Online IPE is an alternative learning model that can be applied to various health professional education institutions, not to mention in Indonesia. This model is expected to overcome the problem due to restriction of social contact such as what happen during COVID-19 pandemic, which requires students to minimize direct face-to-face contact with other students. Online IPE is expected to overcome geographical distance issues during learning.[8,9] In normal situations, the use of the online IPE learning model is expected to overcome the problem of scheduling due to the fixed and tense curriculum of each health study program, as online IPE can be carried out flexibly outside of learning hours. Therefore, scheduling IPE events outside the student's learning hours is an option, and the implementation of online IPE learning is one alternative to solve this problem.[10,11] The problems that are widely known to be faced by educational institutions when implementing IPE include those related to learning logistics such as facilities, the number of tutors that must be involved, learning schedules, and a very constricted curriculum. IPE implementation remains a challenge for the IPE team in charge of organizing and managing IPE learning activities for all health profession programs. The characteristics of online IPE that do not require small group discussion rooms and clinical skill classes can help overcome logistical issue regarding providing classroom for learning. By implementing the online IPE learning, students from various professional backgrounds and from any distance places can still interact to learn together in virtual rooms rather than classrooms.[9,12] Literature suggested some online IPE models such as interprofessional simulation,[13] blended learning with virtual discussion,[14] online problem-based learning,[15] online small group discussion,[11] and case-based virtual discussion.[11] Innovation is necessary so that those online learning activities can be implemented to facilitate students develop the competencies needed as healthcare team members even though learning activities are carried out virtually.

It is well known that the goal of case-based learning (CBL) is to prepare students for clinical practice, using authentic clinical cases. It links theory to practice, through the application of knowledge to the cases, using inquiry-based learning methods.[16] It was reported that the advantages of the case-based learning are promotion of self-directed learning, clinical reasoning, clinical problem solving, and decision-making by providing repeated experiences in class and by enabling students to focus on the complexity of clinical care.[17] CBL promotes deeper learning. That is, learning that goes beyond simple identification of correct answers and is more aligned with either evidence of critical thinking or changes in behavior and generalizability of learning to new cases.[18] By discussing a clinical case, students evaluated their own understanding of the concept using a high order of cognition. This process encourages active learning and produces

a more productive outcome.[19] As a learning model that applies discussion, CBL is experiential, reflective, and intended to be interactive. Like PBL, CBL provides opportunities to discuss, argue, present, and hear one another's viewpoints, thus contributing to the intellectual growth of students. Essential for effective active learning like PBL as well as CBL is that students actively construct and reconstruct their knowledge by working collaboratively to summarize, ask critical questions, and correct misconceptions during the process of solving patient problems.[20,21] Those what collaborative knowledge process are about. To date, research into evaluation of CBL's effectiveness as learning approach has, among others, explored the level of critical thinking after the CBL intervention using Kirkpatrick's outcomes hierarchy,[22] evaluated deeper learning using "SOLO" taxonomy, developed by Biggs and Collis,[17] evaluated the levels of thinking and preparation for practice using Watson-Glaser Critical Thinking Appraisal, measured higher learning outcomes queried dental school graduates who had completed a CBL course during their dental school training using survey.[23] However, whether the working ingredients of CBL, such as constructive and collaborative activities for solving patient's problem, will still work when case-based learning is done within an interprofessional learning setting and virtually remains to be evaluated. Based on these considerations, this study aimed at evaluating the effectiveness of an IPE online project implementing interprofessional case-based virtual learning by examining the students' collaborative knowledge construction during the online interprofessional case-based learning and exploring students' perceptions toward the mentioned learning approach for IPE. Two research questions will be answered through this study:

1. How is the construction of student knowledge during online IPE using online interprofessional case-based learning?
2. How do students perceive their learning during online interprofessional case-based learning?

Method

Context

In Indonesia, all undergraduate health profession programs have introduced interprofessional collaboration skills to their core curriculum. However, very few Universities and Health professions education institutions have incorporated an IPE programme into their curriculum due to some issues. Universitas Islam Sultan Agung officially implemented IPE in 2017, however, since 2012 the University has conducted several pilot projects on IPE, including interprofessional PBL tutorials and simulations as well as community-based interprofessional learning for medical, nursing, dentistry, pharmacy and midwifery programs.[24–26] In its development, students from medical, nursing, midwifery, pharmacy and dentistry programs usually take part the IPE program that makes the total number of students involved in IPE for each semester will mostly be around 400 to 700 students. The students will be divided into some small interprofessional groups with 12 to 14 students each. This situation requires lots of logistics to provide, such as rooms for small group discussions, clinical skills training classes, tutors or facilitators, mannequins, standardized simulated patient, etc. Moreover, learning in all health study programs is mostly carried out in a uni-professional manner. All programs have different lengths of study. Medical education is carried out within 6 years, and both midwifery and nursing program is done in 5 years. Medical and nursing students who took part this study were from third year, meanwhile midwifery students were from second year. Moreover, all programs have a very packed curriculum with tight schedule. The tense learning schedule is one of important problems that can hinder the implementation of IPE.[6] Those backgrounds prompted the IPE champion at Universitas Islam Sultan Agung to create an online IPE innovation to overcome the density of participants and the tight schedule as well as shortage of rooms and other logistics problems.

Online Learning

Students from all health professional programs at Universitas Islam Sultan Agung have been accustomed to using e-Learning facilities provided by the university even before the pandemic period. This e-learning application is used by students to communicate with lecturers and fellow learners, as well as to submit assignments and conduct independent learning. Although all lectures, small group discussions, laboratory practicum and clinical skills were always carried out offline, learning models such as the Flipped classroom method have often been applied by lecturers since before the

pandemic. Drastic shift occurred during the pandemic due to social distancing rules to prevent the spread of COVID-19. For the learning activities to continue, all learning activities are performed online, even including clinical and practical activities in the laboratory which are supposed to be done offline as an experiential learning model. These swift required students and lecturers to master communication technology in the form of commonly used video conferencing such as Google meet and Zoom.

Online Case-Based Learning Model

Case-based learning (CBL) is one of the learning approaches used in the undergraduate program of health professions education. In the undergraduate program, CBL is done by a group of students to discuss a given scenario of patient case. Within this IPE Project, the CBL was implemented for discussing the questions for history taking which are aimed to explore the patient's health status and condition, physical examinations and diagnostic examinations needed to decide some differential diagnosis. Furthermore, after conducting history taking and examinations to collect data from standardized patients, students will meet again to the second case-based learning to discuss management plans, both pharmacological and non-pharmacological therapy. The CBL activity was facilitated by a tutor. The scenario and the learning objectives of the online CBL are presented in Box 1.

Research Design

We applied interventional study using quantitative and qualitative method to answer the research questions. A total of 476 students consisted of 204 medical students, 39 midwifery students and 233 nursing students participated the IPE-online research. All students were divided into 34 interprofessional groups with 14 students each and each group consisted of 6 medical students 1 midwifery student and 7 nursing students.

Quantitative Data Collection and Analysis

To evaluate collaborative knowledge construction, data were collected using Maastricht Peer Activity Rating Scale (MPARS) developed by Kamp.[27] This instrument has been used in a study to evaluate collaborative knowledge

Box 1 Scenario and Learning Objectives of Online CBL Activities

Scenario A 17-year-old with 34-week pregnant woman (G1P0A0) came to the Basic Emergency Obstetrics and Neonatology Services of a Public Health Center with complaints of headache since two days ago. She had no appetite although sometimes she felt hungry. Previous examinations revealed that she had anemia and was suggested to take Fe supplement.
CBL 1 (First meeting): 3 hours Learning objectives: After studying the scenario and to be able to dig up information from patient that will be needed to diagnose the patient's health problem and to determine nursing diagnosis, students are expected to 1. identify patient problems and determine possible causes of patient health problems 2. discuss the list of questions to ask during the history taking (All professions must prepare questions for patient) 3. discuss the list of examinations to be carried to gather patient's data 4. discuss the diagnostic procedures required
CBL 2 (Third meeting): 3 hours Based on the data that the students gathered from anamnesis and examinations in the second meeting (previous meeting), students are expected to be able to 1. diagnose the patient's health problems 2. discuss patient management including the pharmacological and non-pharmacological treatments, nursing care and home care (if needed) 3. discuss list of education for patient and family members

construction within interprofessional Problem-Based Learning (i-PBL).[28] The MAPRS consists of 14 items aims to measure the constructive, collaborative, and motivational activities of peers within a discussion group. The constructive activity scale on the MPARS assesses skills in collaborating to construct knowledge such as concluding, describing the difference between important and unimportant issues, asking critical questions, correcting misconceptions, and contributing to a better understanding of the discussed topics. Collaborative activities measure collaborative performance during case-based discussions, such as the influence of students in groups, responsibility for group work, willingness to share knowledge, and commitment to the group. Motivational activities evaluate students' motivation during discussion activities. The MPARS questionnaire has been translated into Indonesian language, and the version was previously used in Lestari's study.[28] An inter-rater test to evaluate the reliability of the Indonesian version of the questionnaire was reported in the study, and the validity test showed that all the items were valid. The instrument uses a 5-point Likert scale (1) strongly disagree (2) disagree, (3) undecided (4) agree and (5) strongly agree. MPARS as a peer assessment tool in the online learning context has not been reported, so the use of this measuring tool to assess collaborative performance in knowledge construction within online interprofessional CBD is up to date. Judgment bias may occur due to cultural setting. Measuring tool carried out by peers like MPARS and other peer assessment tools might create too many feelings of discomfort in a cultural Asian setting where saving face and speaking up are not self-evident.[29] Therefore, in this study, the authors placed great emphasis on tutors to make students understand and realize that the function of this assessment was to provide feedback to their peers, so that the feedback can be used to improve their peers' performance. To answer the students' performance in collaborative knowledge construction activity, the data was then statistically analysis using One Way Anova employing SPSS (IBM SPSS for Windows-27).

Qualitative Data Collection and Analysis

To gain an in-depth understanding of student performance during online interprofessional CBL, the authors conducted a focus group discussion in the wrap-up session. Focus group discussions were conducted in mixed profession groups, so that students' evaluations and perceptions can be heard by students from all professional background. There were 5 FGD sessions recorded for analysis, those were obtained from group 10, 23, 24, 30, 33. The FGDs were then transcribed verbatim by the expert and coded without losing the original content of each statement. Two researchers analysed the qualitative data by applying thematic analysis. Each researcher analysed his own data based on the agreed coding, then all researchers agreed on the main themes that could be drawn into important topics. The entire process of qualitative data analysis was performed using ATLAS Ti software (version 8).

Learning Settings

Online IPE activities last for 6 weekdays with a total meeting time of 28 hours. Medical, midwifery and nursing students (476 students) were divided into 34 mixed professional groups with 13–14 students each. The learning approaches used for online IPE were online lectures, online Interprofessional CBL, online reading journal articles, online I-simulation with standardized patients. Zoom video conferencing facilities with 34 breakout rooms were provided to facilitate the learning as students must learn together within interprofessional group at the same time. Standardized patients were also provided by the study programs involved for online patient encounter activities. Forty tutors from medical, nursing and midwifery program took part the study and they facilitated the learning activities virtually from their own residences.

The Online IPE learning activities were carried out as follows. First, students in small groups were given a case scenario to discuss in the case-based learning. The purpose of the first case-based learning was to understand the patient problem, decided differential diagnosis based on the information within the scenario, and decided a list of questions to be delivered to the standardized patient during history taking practice, and decide list of examination and diagnostic procedure. The second meeting, the groups met with standardized patients to do history taking practice to collect information regarding patients' health problem. Right after that, the groups gathered in the small group Zoom room to analyse the results of the history taking for discussing a definite diagnosis and plan for pharmacotherapeutic and non-pharmacotherapeutic management. The next day, on the third meeting, the groups met again with standardized patients to explain the diagnosis and the treatment plan as well as to provide education on drug use. At the end of the meeting, students conducted reflection and evaluation sessions. Reflection was done on the process of collaboration,

communication, leadership, and respect for other professions during the online IPE process. Evaluation was carried out on all aspects including evaluation of student performance during the discussion. All activities were conducted online. Students meet and learn together virtually at the same time in Zoom room. For that purpose, thirty-four breakout Zoom rooms were provided for the 34 interprofessional groups (See Figure 1).

Results

Four hundred seventy-six students from the medical, midwifery and nursing programs and 34 tutors took part in the online IPE program, and all of them submitted the MPARS, giving the response rate of 100%. The characteristics of the student participants are described in Table 1.

The number of female students is four times higher than the number of male students (81.9% and 18.1% respectively). All students from the midwifery program were female. Medical and nursing participants were from the 2019 entry year while all midwifery participants were from the 2018 entry year. All nursing and midwifery students had experience of taking care patients during their clinical practice in hospital and public health centres, while medical

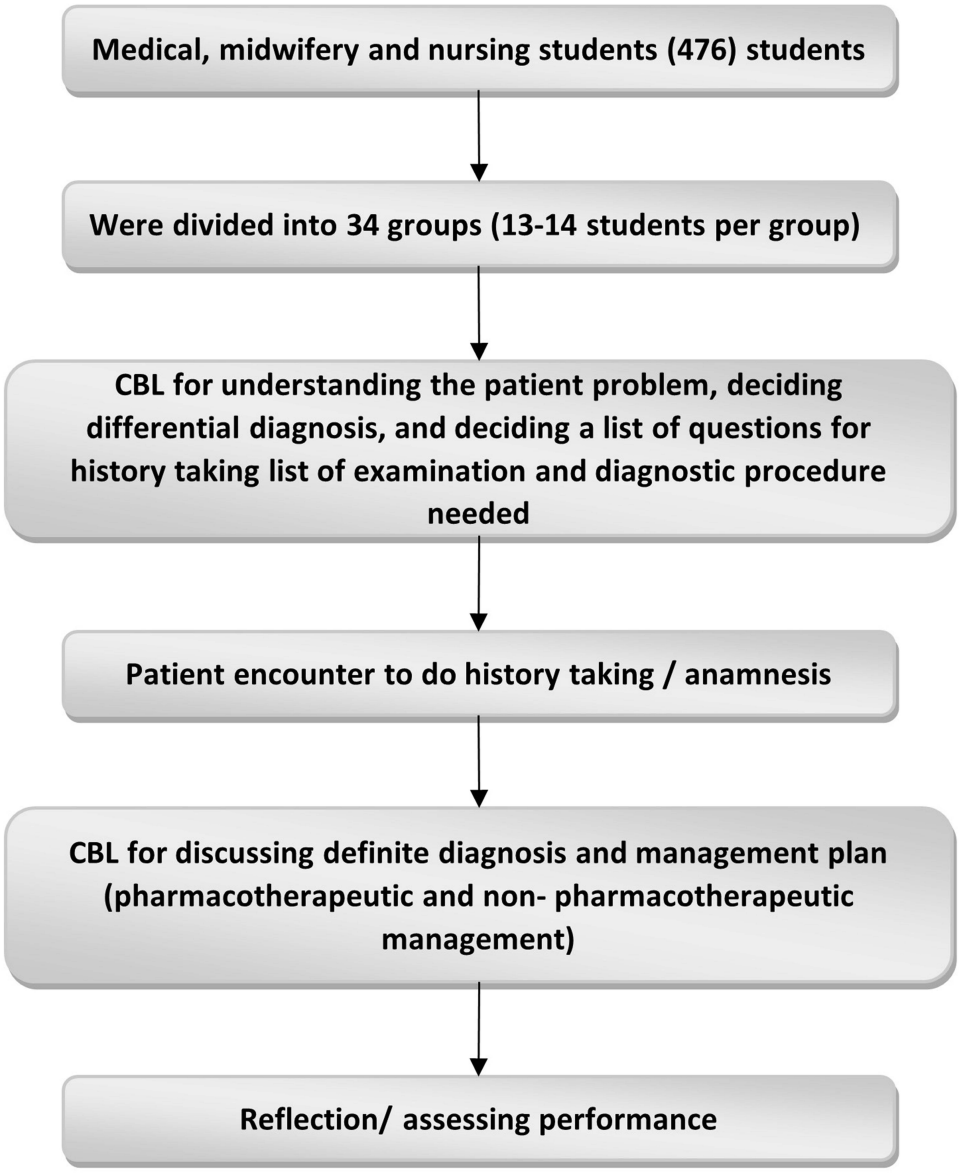

Figure 1 Online IPE activities.

Table 1 Characteristics of the Participants

	Medical Student		Midwifery Student		Nursing Student		Total	
	N=204		N= 39		N= 233		N=476	
	N	%	N	%	N	%	N	%
Sex								
Male	48	23	0	0	38	16	86	18.1
Female	156	77	39	100	195	84	390	81.9
Year entry								
2019	204	100	0	0	233	100	437	91.8
2018	0	0	39	100	0	0	39	8.2

students had no experience of any interaction with real patients. Medical students have their clinical skill practice mostly with standardized patients.

Overview of Collaborative Knowledge Construction in Online IPE Applying Case-Based Learning

The results of statistical analysis indicated that medical and midwifery students had better performance of constructive, collaborative, and motivational activities than nursing students. Nursing students had the lowest mean scores compared to the other two fellow groups for all categories. The scores of constructive activities of medical, midwifery and nursing students were 21.02, 20.93 and 17.73, respectively. Their scores of collaborative activities were 21.68, 21.52, and 18.90, respectively and their scores of motivational activities were 16.59, 16.57, and 14.04 respectively. The ANOVA test showed that there were significant differences of means of constructive and collaborative activities and motivation among groups ($p < 0.001$) (Table 2).

Based on the MPARS, it can be inferred that students were actively involved in the discussion and contributed to a better understanding regardless of their professional background. Medical and midwifery students contributed the most

Table 2 Mean Scores of MPARS

Knowledge Construction Activities	Medical Student		Midwifery Student		Nursing Student		p
	Mean	SD	Mean	SD	Mean	SD	
Students can conclude the discussion	4.29	0.7	4.16	0.61	3.59	0.9	<0.001
Students can distinguish the main topic and additional topics during the discussion	4.20	0.67	4.22	0.6	3.67	0.89	<0.001
Students can ask critical questions	4.11	0.80	4.13	0.83	3.41	1.02	<0.001
Students can correct misconceptions made by other students.	4.13	0.73	4.11	0.84	3.44	0.95	<0.001
Students can contribute in improving understanding of the topics discussed	4.28	0.71	4.31	0.68	3.62	0.97	<0.001
Total Constructive activity score	21.02	2.98	20.93	2.9	17.73	4.2	<0.001
Collaborative Activities	Medical Student		Midwifery Student		Nursing Student		p
	Mean	SD	Mean	SD	Mean	SD	
Students have a positive influence on the group	4.36	0.74	4.35	0.65	3.76	0.94	<0.001*
Students are responsible for the group	4.38	0.68	4.17	0.73	3.74	1.01	<0.001*

(*Continued*)

Table 2 (Continued).

Knowledge Construction Activities	Medical Student		Midwifery Student		Nursing Student		p
	Mean	SD	Mean	SD	Mean	SD	
Students can work with all group members	4.38	0.72	4.27	0.68	3.81	0.97	<0.001*
Students are willing to share knowledge / knowledge and information	4.26	0.798	4.43	0.67	3.84	0.92	<0.001*
Students have a commitment to the group	4.29	0.77	4.28	0.70	3.73	0.95	<0.001*
Total Collaborative activity Score	21.68	3.23	21.52	2.7	18.90	4.3	<0.001*
Motivation Activity	Medical Student		Midwifery Student		Nursing Student		p
	Mean	SD	Mean	SD	Mean	SD	
This student is very motivated in carrying out SGD	4.22	0.76	4.09	0.73	3.36	0.96	<0.001*
This student participated well	4.38	0.52	4.31	0.63	3.74	1.01	<0.001*
This student actively participated during the brainstorming session	4.21	0.77	4.19	0.67	3.49	1.02	<0.001*
This student contributes more than other students	3.76	0.91	3.97	0.85	3.24	1.07	<0.001*
Total Motivation Score	16.59	2.63	16.57	2.36	14.04	3.69	<0.001*

Note: *Mean scores were significantly difference based on One Way ANOVA test.

in the discussion. The experience of being involved in health care practice in public health center contributed midwifery students to elaborating knowledge of patient management and treatment for normal pregnancy and collaborative pregnancy care. Meanwhile, nursing students were the least active group. However, they were actively concerned with practical and non-pharmacotherapeutic management of the patient.

Results of Qualitative Data Analysis

To address the research question "how do students perceive their learning during online interprofessional case-based learning (i-CBL)?" and to allow for a better understanding of the interprofessional CBL process, we organized mixed-professional focus groups. Five main themes were identified from the FGD, specifically: (1) students could encourage and complement each other during the I-CBD, (2) students learn from each other professions, (3) overlapping roles occurred and was resolved by negotiation and dividing roles, (4) although studying online, students could learn to collaborate and communicate, (5) nursing students need to be more confidence in expressing idea during discussion, (6) benefit and shortcomings of online IPE.

Students Could Encourage and Complement Each Other During the I-CBL

Focus Group Discussion revealed that during discussion activities, students could collaborate to complement the opinions of other professions, just like when they do offline discussion. Students could also motivate each other, provide equal opportunities for group members to collaborate and express their ideas. Although they did the discussion online, the process of discussion was no way different from that of offline.

> I think doing IPE with students from other professions is interesting as during discussion students from other professions can complete the lack of therapy that we suggested. If we, medical students always think about providing pharmacological therapy, then midwifery and nursing students usually think about non-pharmacological therapies, for example how to make patients feel comfortable, calming down patient's family and so on and so forth. It's an interesting experience. (Medical student 1)

> During the discussion of journal article, we shared the roles so that the tasks can be completed quickly. We must trust that everyone can do their job. As previously explained during a lecture, trust to other professions is the main basis for collaboration. However, when the assignment was about to be submitted, we found out that nursing students were not able to complete their

assignments well because, apparently, previously they had never received journal reading training. So, we helped them to complete the task assigned to them. (Midwifery student 3)

Students Learn from Each Other Professions

During the FGDs, students stated that they could benefit from IPE activities which set students from different professions to study together. They could learn from other professions during online discussions. In addition, by learning from other professions, students were also aware of the limitations of their profession which could be covered by other professions and that good collaboration would be greatly beneficial for patient management. This awareness of the limitation of own profession could also motivate students to study harder to cover the shortcomings, so that they could collaborate on an equal basis with other professions in the future.

I learned a lot from medical students about pharmacological therapy and deciding diagnosis in a coherent step-by-step manner. I learned from midwifery students that they have interesting non-pharmacological therapy ideas. We are happy to have the opportunity to study in IPE. Maybe not all nursing students from other universities get this opportunity, but we got it at Unissula. (Nursing student 1)

From midwifery students we learn about integrated maternity services. They acquired these materials and skills during clinical practice in public health centre. We haven't practiced in the centre so we don't understand the concept yet. In the future, we need to study this issue so that we have the same frequency as midwifery students during discussions (Medical student 4)

I learned a lot from medical and midwifery students in this patient case. For example, from midwifery students we learned about interesting ideas for adjunctive and non-pharmacotherapy for patients, which we had never learnt of before. (Nursing student 3)

Overlapping Roles Occurred and Were Resolved by Negotiation and Dividing Roles

It is undeniable that overlapping roles occur during IPE online activities, because all the professions involved have received courses related to obstetrics and gynecology as well as maternity. Some of the general skills for the purposes of managing these Obstetrics and gynecology cases must be learned and mastered by the three professions. The example of role overlapping could be learnt from the fact when students had to determine which profession should be in charge with conducting pregnancy tests, and that they were confused whether this should be done by medical or midwifery students. Facing this problem, the steps taken by the leader of the group was interesting as they negotiate the roles and tend to share the roles evenly rather than gave the task to specific profession. With this decision, each profession within the group could contribute to the management of patient.

During the discussion, we were surprised to learn that the therapy plan we were going to suggest to the group had been proposed by nursing students. It turns out that they also had the same role as us, which is to make the pregnant woman feel comfortable during the treatment process. We immediately had to think of adding another non-pharmacological therapy model that we thought would complement the therapy proposed by nursing students. No, we were not disappointed, in fact we are happy to be able to think up a therapy plan quickly. This is a challenge for us. (Midwifery student 3)

When overlapping role occurred, the role of the group leader is very important for negotiation and sharing the roles. We are lucky to have a group leader like ours. (Nursing student 5)

Although Studying Online, Students Could Learn to Collaborate and Communicate

Students perceived that even though the learning activity was conducted online, they still had the opportunity to practice interprofessional collaboration and communication well. They could learn to express idea, to negotiate things, to share roles, to collaborate and to provide opportunities for all professions to contribute during discussion.

During the IPE activity, even though it was conducted online, we were able to practice our interprofessional communication skills well. We can ask for help from other professions, share tasks, help each other and so on. We are happy to learn it now

before we graduate as doctors. If this kind of activity is done repeatedly, it is hoped that later when we run a medical practice, we will get used to communicate with other professions in respectful manner (Medical student 2)

Thank God, no one was offended during our communication, interaction and collaboration with students from other professions. Everyone respects each other, communication run smoothly. We even often do coordination outside of class hours using WhatsApp. (Midwifery students 8)

Nursing Students Need to Be More Confidence in Expressing Idea During Discussion

Medical and midwifery students reported that nursing students still did not contribute much and seemed less confident during collaborative practice. They explained that they had tried to encourage nursing students, but the contributions have not been significant. They hope that in the future nursing students could equip themselves with knowledge and skills needed to collaborate, so that they could contribute equally. Information from medical and midwifery students was supported by MPARS results which indicated that nursing students' scores on all items were lower and significantly different from the MPARS scores of medical and midwifery students.

On this occasion I would like to provide feedback for nursing students. I hope that in the future collaboration, nursing students can be more confident expressing their opinions. To be more confident, I think you have to equip yourself with knowledge and skill related to the case. (Midwifery student 5)

We realized that the nursing students at the beginning had not contributed much. It might be due to their less confidence. However, at the end part of our programs it turned out that they did better. I think they need time to be close and feel comfortable with us. So later in the next IPE program, let's work together to solve patient problems. Surely you can (Medical student 4)

When nursing students were asked about the reason, they were not very confident in collaborating, they replied that currently, at the time of IPE programme, they were about carrying out community service activities in the village, so their concentration and focus were not only to the IPE programme. In addition, they were openly expressed that they were not too used to having discussions because Problem-Based Learning (PBL) with small group discussion was not their core learning approach like in medical and midwifery program.

Benefit and Limitation of Online IPE

Regarding the question of the advantages and disadvantages of online IPE, students expressed that there were so many advantages they had by studying within IPE even though it was executed online and even though they were separated by distance and time. They could still learn collaboration skills, roles sharing, communication, leadership, and other skills through this online IPE program. However, they thought that it would be better if they could learn together offline so they could create a stronger bond of cooperation.

We benefit from this online IPE, because even though we are in the village for community service and it is not possible to come to campus, we can still study together with colleagues from other study programs in this IPE. (Nursing student 5)

On the one hand, there are benefits for students who are not able to go to campus because of the distance. However, because this IPE activity includes clinical skills such as yesterday's patient encounter, it would be better if it was done offline, so that we could meet the patient face-to-face. (Medical student 6)

I prefer offline IPE, by meeting face-to-face, we can communicate better and strengthen the bond, so our relationship is not stiff. This is important for collaboration. (Midwifery student 4)

Discussion

We set out this research to study how students engage in collaborative knowledge construction in online interprofessional education implementing case-based learning, how the performance of each professional group differed and how students perceived their collaboration during the online interprofessional CBL.

The findings from MPARS and Focus Group Discussion revealed that students could perform interprofessional Case-Based Learning activities well, even though the learning process was carried out online. Students could practice interprofessional communication, negotiation, sharing roles, and practice leadership skills. Based on the result of a survey using MPARS assessed by peers, it was in evidence that students can perform constructive, collaborative, and motivational activities during the online interprofessional CBL. Students could collaborate in developing knowledge and complementing one another's perspective. They shared knowledge and learned from and about other professions. These results indicated that online interprofessional CBL can be used as an alternative learning model, and that CBL, like PBL, fulfils the objectives of IPE, such as, to learn about the experiences of other professions in order to learn their roles and competencies to get better understanding of them.[30] The findings of this study confirm previous studies that online interprofessional education was valuable and that students were favourable to the use of ICTs in the delivery of IPE.[9,11]

Students reported that during the online i-CBL they could learn from other professions, and interestingly by learning from these other professions, an understanding of the need for collaboration with other professions grew to cover their limitations. Learning from other professions can develop a sense of respect for the roles of other professions. Other previous study reported that discussions including PBL and CBL in IPE activities can foster a more positive attitude toward other professions and improve interprofessional relationships.[31] Students in the interprofessional group achieved interprofessional learning from recognizing the differences between professions to appreciating learning from each other and to sense the need of future collaboration. With early exposure to IPE, students may learn to balance their socialized viewpoints by seeing ethical dilemmas from each other's position.[32] Moreover, the findings also confirm that online learning environment was shown to facilitate small-group collaborative interactions and enable positive and novel forms of student interaction and facilitate student learning.[13,33]

The results of this study indicate that nursing students had the lowest scores compared to two other fellow professions, medical and midwifery students in all items of MPARS. In addition, medical students obtained the highest MPARS scores. From the FGD, it was found that nursing students had some shortcomings during the discussion process, since they had lack of experience in conducting discussion due to the curriculum used in the school was conventional model which rely on lecturing. On the other hand, medical and midwifery programs implemented PBL curriculum which discussion is becoming the core activities. Literatures reported that discussion methods such as PBL and CBL can increase self-confidence, improve opinion sharing skills.[34,35] However, the benefits of discussion-based learning approaches such as PBL and CBL in Asia are hampered because students prefer classical learning models, didactic lectures and memorization.[36] Previous study regarding the implementation of discussion; such as PBL and CBL; as learning approach for nursing students also reported that since the approaches require students to be active participants in the learning process; such as being expected to participate in discussion, question, learn, and respond during the sessions; this creates significant tension in students because they lacked passion for what they study[37] and students were less motivated due to the stressful process and increased workload.[38] Moreover, scenario that was used as discussion trigger needs to be evaluated whether it addresses students' competency. In the PBL as well as CBL literature, scenarios play at least three roles in the construction of the learning environment that discussion of the scenarios serves to encourage students to activate relevant prior knowledge, stimulates students' interest and thus their intrinsic motivation to learn, and sets a context for the learning of knowledge similar to that in which future use of the knowledge will be required.[39] If the scenario could not set the context for the learning of knowledge that will be used by nurses in their future work, it means it does not address nursing competency. This situation will make nursing students difficult and less motivated to participate within the discussion process. Other situation that influenced nursing students' performance was that during the time of online IPE learning within this study, nursing students were in rural areas to conduct community service activities. This condition hampered them to access learning resources from the library, even though they could access online learning resources for their independent study.

This study provides evidence that online CBL activities can train students to practice interprofessional collaboration, to practice communication, to respect other professions and to work in groups. Previous studies that applied interprofessional PBL also reported the same findings. Students can collaborate and learn the importance of mutual respect between professions and respect for other professions, collaborate to construct knowledge through problem solving activities.[14,28]

However, apart from being able to educate students to collaborate even though they were separated by distance and time, online CBL has limitation as a collaborative learning model since intense interaction could not be performed. From FGD, we learned that students in this study conveyed their preference of offline interprofessional learning due to their need to develop interprofessional bond for better collaboration and effective team. It is well known that collaboration requires intense interaction and physical encounters which allow students to build interpersonal relationships. Beckhard introduced four elements that group members must do to build an effective team. The four elements of group building are: Goals (finding goals), Roles (distribution and integration of roles and responsibilities), process (processes/procedures of the job, decision-making method), and Interpersonal relationships (interaction and relationships between members). These four elements must be implemented in order to build an effective team (Figure 2).[40] Gibb also explained four basic elements present in individuals' relationships with others. The four elements are acceptance (ie, anxiety about the acceptance of oneself and others), data flow (anxiety about the expression of one's own thoughts and feelings), goal formation (concern about a common goal), and social control (concern about the division of roles and mutual dependence).[41] By implementing these concerns in order, mutual dependence between team members increases and the team develops as a whole.[40] Considering those concepts, intense offline face-to-face meetings and interactions need to be presented so that students can build good interpersonal relationships as the basic element in building a solid team. The MPARS and students' reflections on the need of face to face offline meeting among professions within IPE recommended that interprofessional education could be performed in a hybrid way. Discussion activities might be performed online, but clinical skills activities should still be done offline. Paradise and Whitehead reported that interprofessional training can be carried out well if it is applied in a workplace that requires learners to meet, interact to work together.[22] Ambulatory interprofessional care practice,[42] ward based interprofessional learning,[43–45] team-based learning,[46,47] community-based interprofessional learning[26] are among suggested method for IPE which can ensure students to interact and cooperate with each other.

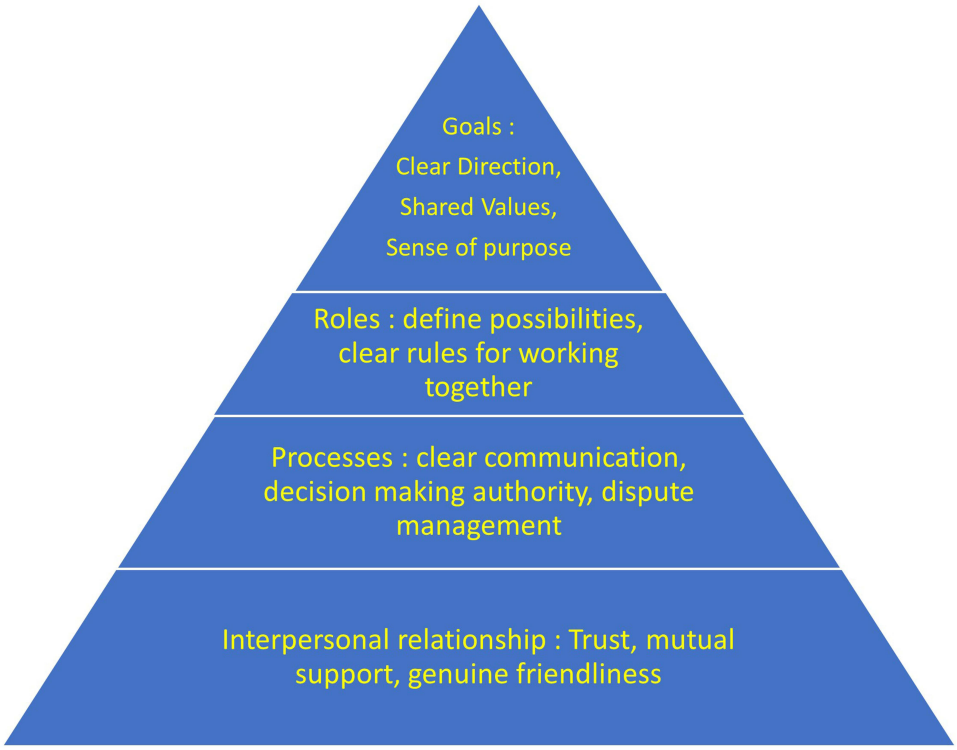

Figure 2 Beckhard's model for effective team building.

The limitation of this study was that the research was conducted only at one institution, which was in Universitas Islam Sultan Agung. The participant may not represent all health professional students in Indonesia. Nevertheless, the substantial number of participants in this study is expected to provide a close picture of the real situation in the population. Future research can be done among larger number of participants from various health professional background and by covering samples from multi centres.

Conclusion

This study contributes to the literature since it provides pedagogical implications through evaluating students' actual performance in online IPE program implementing case-based learning approach. The findings provide evidence that online case-based learning can be used as learning model for IPE and is worth to implement to solve problems of social distancing during pandemic and to solve issue of facility shortcomings. There was evidence from this study that MPARS was valid and reliable instrument to evaluate students' constructive and collaborative activities during online interprofessional case-based learning. However, this study also revealed that students preferred offline learning to develop effective team. Previous studies also suggested interprofessional learning will be well conducted if it is applied in a workplace that requires learners to meet face to face and interact. These findings provide scientific evidence for hybrid learning for IPE. Future studies could evaluate the effectiveness of hybrid interprofessional learning for training students to acquire skills needed for interprofessional collaborative practice.

Data Sharing Statement

Materials and supporting data are deidentified; however, they are available for download on the website: https://drive.google.com/drive/u/1/folders/1hHDC85QL4imcpLe4GbSwKPMji66wsEya. All files may be used for research and education with further consent.

Ethics

Ethics approval and consent to participate in the study was approved by the Bioethics Committee for Medical/Health Research Faculty of Medicine Islamic University of Sultan Agung Semarang (Letter No. 130/IV/2022/Komisi Bioetik) and was conducted at Universitas Islam Sultan Agung, Semarang, Indonesia. Taking part in the study posed no physical risk to participants. All participants provided informed consent which included publication of anonymized responses.

Acknowledgments

The authors wish to thank the Directorate General of Higher Education, Ministry of Education, Culture, Research and Technology of Republic of Indonesia, for funding the project and all students who participated in the study; Interprofessional Education Champions of Universitas Islam Sultan Agung, for their assistance in conducting the study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This project was funded by Directorate General of Higher Education, Ministry of Education, Culture, Research and Technology of Republic of Indonesia.

Disclosure

The authors declare that they have no competing interests.

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