# Online Interprofessional Simulation in Indonesian Health Institutions: Assessing Students' Readiness and Group Discussion Activities during COVID-19

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**Abstract**— **Background**: COVID-19 pandemic is a deadly disease that has affected health education institutions. During this time, these institutions went through a lot of changes. They moved from face-to-face learning to virtual learning, and one of the courses that should be taught online is interprofessional education (IPE). This study aimed to measure students group discussion activities and students' readiness during online interprofessional simulation based on case scenarios with standardized patients (SPs). **Methods**: The respondents were 956 students, 112 instructors, and 15 SPs. The study was done at six Indonesian colleges of health professions with students in nursing, midwifery, pharmacy, environmental sanitation, medical laboratory technology, dental health, and nutrition. Collecting data was done by using an online survey of the RIPLS (readiness of interprofessional learning scale) and IGD scales. **Results**: The results showed that how students felt about their readiness for IPE and activities during IGD depended a lot on the type of discipline, the degree program, and the number of people in the group. Multi-comparisons using post-hoc tests showed that the type, degree program, and several disciplines have a big impact on IPE and IGD readiness. **Conclusion:** An online interprofessional simulation that used case-based scenarios and involved SPs showed positive and meaningful results in group discussion activities and learning readiness. It takes careful planning to combine online IPE learning with other professions or fields of study while combating the COVID-19 pandemic.

**Keywords—** interprofessional education, online learning, health profession students, patient simulation, case scenario

## 1. Introduction

COVID-19 pandemic is a deadly disease that has impacted higher education institutions. These institutions experienced significant changes during the period, shifting from face-to-face to virtual learning. Almost all learning activities in health education institutions, without exception practicum and field practice, were conducted online [1], [2]. The implementation of e-learning has not reached its full potential in Indonesian institutions. Following the pandemic, all institutions experienced significant transformations [3], [4], and interprofessional education (IPE) is one of the courses that should be taught online. The pandemic has postponed nearly all offline IPE activities. Redesigning programs and rescheduling activities are significant challenges and necessary conditions when considering IPE as cross-professional learning [5]–[7]. The prolonged pandemic has prompted institutions to create various innovations to ensure that learning designs can be implemented while considering the actual situation. These various innovations can motivate students to acquire the required competencies even when online learning is conducted [3], [8].

As previously stated, IPE is still considered novel by Indonesia, and many health education institutions have yet to incorporate it into their curricula. It is necessary to initiate a program to ensure that institutional administrators, educators, and members of institutional networks (such as hospitals, primary health centers,

medical laboratories, etc.) fully comprehend the concept of IPE. The implementation strategy of IPE in the curriculum are divided into three parts: exposure, immersion, and mastery [9], [10]. The exposure level consists of numerous activities designed to introduce students to the concepts of learning, competency domains, and collaborative practices. At the immersion level, learning strategies emphasize the acquisition and application of knowledge, attitudes, and abilities related to IPE. Meanwhile, students will develop IPE competencies at the mastery level through real-world practice. By integrating these concepts, IPE will be comprehensively understood, and the fieldwork topic can serve as a model for collaborative practice [9], [11]. An online learning simulation was created to prepare for the next plan to put the phase into action at the immersion level. By looking through the research articles, we can find several other interprofessional simulation models [12], [13]. Case-based scenarios and standardized patients, sometimes called "SPs," have been used together in several different research studies [14], [15]. The goal of this study is to find out how well students are prepared for interprofessional learning through case-based online simulation with standardized patients. To accomplish this, it will be necessary to assess students' attitudes toward interprofessional group discussions and their readiness for interprofessional learning.

## 2. Methods

### *Course Design*

Due to the prolonged COVID-19 pandemic, interprofessional learning cannot be conducted offline, requiring health education institutions to modify the IPE for online learning. Course design of interprofessional learning is shown in Figure 1. There are three components that are involved in this study such as researchers' team, teachers, and staff as well as students. Researchers team develop educational aids for interprofessional eLearning for teachers and students. Teacher who wants to be the facilitator IPE compulsory to attend the workshop. Students who will participate in this research follow two stages.
Since the COVID-19 pandemic is expected to last for a long time, interprofessional education cannot be done offline. As a result, educational institutions in the health care field will need to adapt IPE to accommodate online education. Figure 1 depicts the overall layout of the interprofessional learning course. There are three different groups of people who are participating in this study: the research team, the teaching staff, and the students themselves. The researchers are working together to develop educational aids for interprofessional learning for both students and teachers. Teachers who are interested in becoming IPE facilitators are required to attend the workshop. Students who are going to participate in this research over the course of two stages. The first step (exposure phase) consisted of a debriefing phase that addressed the idea and domain of IPE, the community health care system, and comprehensive problem-solving techniques. The respondents carried out this activity, and the first day included enlightening information about IPE concepts and domains, illness prevention concepts, integrated problem-solving, cooperation, and collaboration approaches. The second stage (the immersion phase) consisted of a simulation based on the COMIC program model method (Tyastuti et al., 2013) involving hands-on practice. Simulations with triggers, interviews with SPs, and group discussions constituted the activities. In this instance, respondents would adhere to the instructions outlined in Figure 1. IPE group discussions supervised by a tutor encourage collaboration under this paradigm. Many breakout rooms were utilized in conjunction with Zoom to conduct the activity. Each room had a group of students from diverse professions, two lecturers who served as facilitators and observers, and an SP who had been trained.

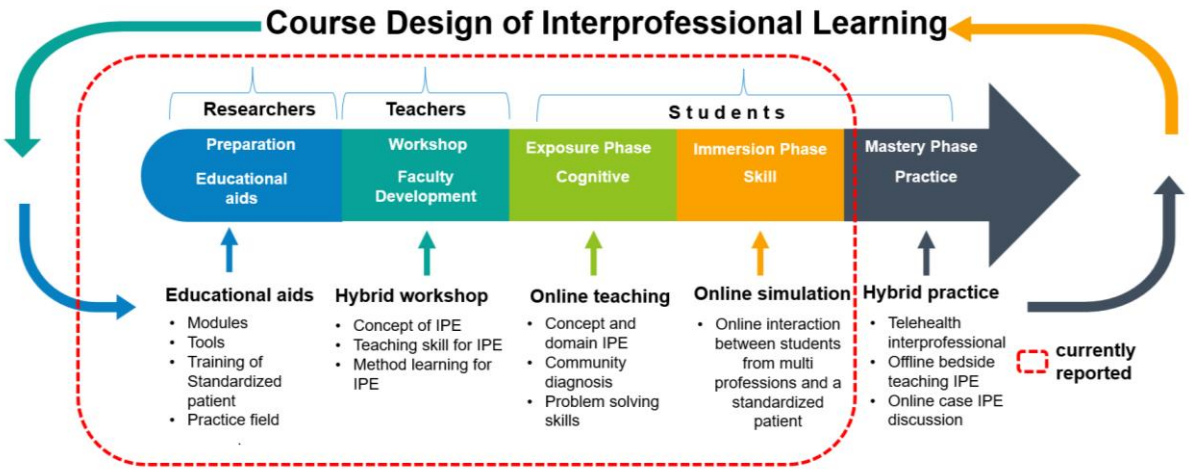


Figure 1. Interprofessional Learning Course Design at Indonesian Poltekkes

***Study Design and Samples***

This action study was conducted using a single group, and the ethical approval was granted by the Research Committee of the Faculty of Medicine, Islamic University of Negeri Syarif Hidayatullah. It included students from six health education institutions (Health Polytechnic, abbreviated Poltekkes), namely Poltekkes Malang, Poltekkes Medan, Poltekkes Riau, Poltekkes Sorong, Poltekkes Tanjungkarang, and Poltekkes Ternate (Figure 2). Furthermore, this study was conducted from November 2020 to June 2021 and involved 956 students from various disciplines, including nutrition, nursing, midwifery, dental health, environmental sanitation, pharmacy, and medical laboratory technology. Respondents were divided into groups of 7–10 people, each with at least two distinct professions.

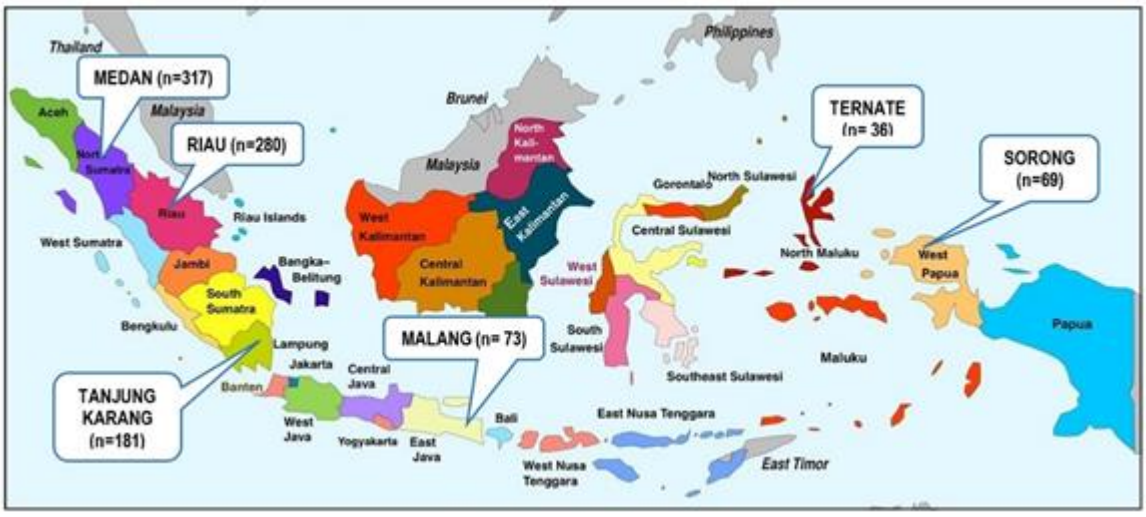


Figure 2. Location distribution of the Poltekkes Ministry of Health and the number of respondents taking part in the online IPE simulation

***The Online Interprofessional Simulation Model***

*The Virtual Patients' Encounters*

In this simulation, the virtual patients were SPs specially trained to serve as a valuable resource for teaching and assessing clinical skills [16]–[18]. A lack of trained SPs was one of the barriers to conducting interprofessional simulation [19], [20]. This study had a small number of highly skilled SPs of approximately

10-15 people, which was insufficient for an institution with many students. The patients are professional actors in good health but have been trained to consistently portray patients suffering from various diseases.

Furthermore, SPs were required to attend the online workshop twice before implementing the simulation activity. The goal of the initial meeting was to explain the program and familiarize respondents with the scenario and simulation model. A week later, SPs had a second meeting with the research team to assess the ability to behave appropriately under the given circumstances. The research team looked at the SPs' skills to determine the similarities with the scenario, such as facial expressions, voice intonation, and specific movements.

***Scenarios and Triggers***

The scenario is based on actual community examples following a specific format [21]. This includes detailed information about patients and their family through demographic data, medical history, and details about the habits, occupation, and home environment conditions. The entire scenario was only distributed to SPs and the research team. The triggers are part of the overall scenario, and are brief sentences describing the patients' primary complaint, supplemented by critical supporting information such as age, the date the complaint occurred, or an accompanying complaint. The triggers guide the group in developing questions to obtain data and information from SPs [19], [22]. "Mr. Andi, 32 years old, visited a primary care clinic one month ago due to cough," according to one of the triggers. "Mr. Andi was accompanied by his 28-year-old wife, Mrs. Ratna, who is pregnant for the third time".

***Facilitator Role***

The facilitators' responsibilities included leading icebreaker activities in students' groups, explaining assignments to simulation, briefly reading the case scenario, observing group discussions, and interacting with SPs. Each lecturer assigned to be a facilitator in the interprofessional simulation had to complete a one-day online IPE training course. This training provided them with resources to enrich IPE knowledge and interprofessional practice simulations. The IPE enrichment material had 12 lecturer roles, concepts, domains, and learning methods [23], [24]. During the interprofessional practice simulation activity, all lecturers were divided into small groups from different professions who served as facilitators and observers. The lecturer team practiced the simulation steps depicted in Figure 3.

***Steps of online interprofessional simulation***

The students and lecturers practiced the simulation steps according to the Tyastuti model (2014) and the flow of activities follows as depicted in Figure 3. The total duration of this activity is half a day (4.5 to 5 hours). The start of the simulation activity was marked by the facilitator joining the student group. The facilitator discussed his or her roles and responsibilities before handing out activity-starting triggers to the students. The facilitator conducted an ice-breaker activity and led a forty-five minute discussion in small groups to assist students prepare for their interview with SP. Second, the SP entered each group's break-out room, and each group had a 30-45-minute interview with an SP. Following the interview, the student group discussed the SP data from each profession's perspective before moving forward with the problem-solving plan. This activity took an hour. Following that, students met again and conveyed to the SP to explain the SP problem and the plan to resolve it. This was a thirty-minute activity. Following completion of this stage, students self-assessed their readiness for interprofessional learning and their perception during interprofessional discussion activities.

***Measurements***

The respondents' attitudes were assessed using a 16-item attitudes scale of readiness for interprofessional learning (RIPLS) [25], [26] and a 12-item perception scale of group discussion. The RIPLS is presented in Indonesian and includes 16 self-assessment statements [26]. The scale is a 5-Likert scale ranging from "Strongly Agree" to "Strongly Disagree". An IGD scale with an excellent Cronbach's alpha (0.927) was used to assess perceptions of IGD. This scale was calculated using a five-Likert scale instrument, ranging from "Strongly Disagree" to "Strongly Agree". The items on this scale assessed how group discussion processes and the usefulness of discussions related to students' learning. A high score indicated that students had a more positive attitude toward interprofessional discussion.

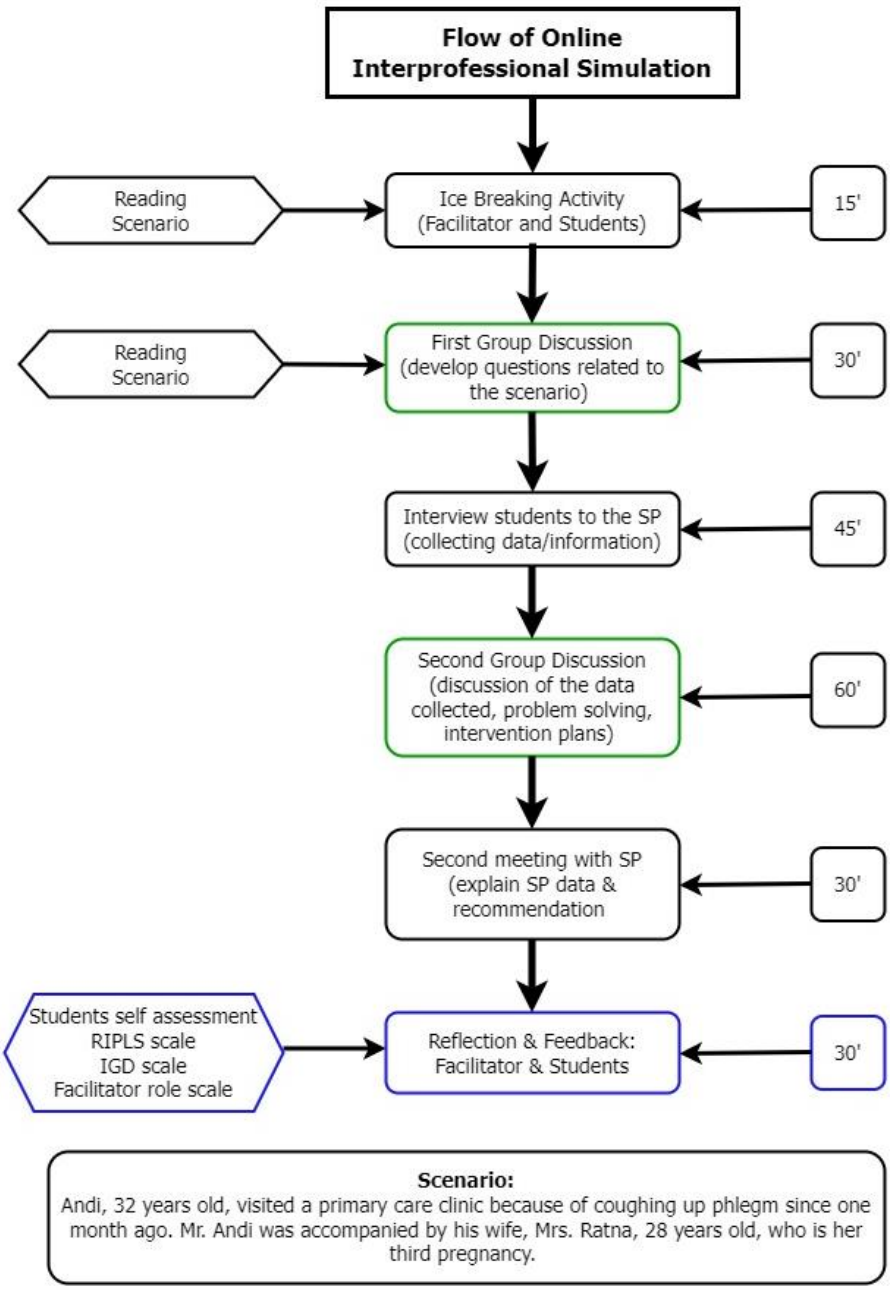


Figure 3. Flow of Online Interprofessional Simulation

***Data Collection and Analysis***

The data was collected completely online, using Google Forms, and exported to Microsoft Excel for cleansing and coding. A statistical analysis of the quantitative data was performed using SPSS 25.0 (SPSS Inc., IBM Corporation, Armonk, NY, USA). The average value was calculated for each scale, and items with negative statements were adjusted before the average was computed. Furthermore, the average of the five Likert scales was used instead of the sum of all items from each scale. Since each scale had a different number of items, this technique made it much easier to compare scales and deal with multiple independent variables. In this study, bivariate analysis was also used to perform a more thorough analysis of each model. The mean score of each scale was compared using the One-way Analysis of Variance (ANOVA) test. Individual differences between groups were assessed using Tuckey's HSD test or Games-Howell comparisons (when the homogeneity assumption is not fulfilled).

## 3. Result

### *Descriptive Analysis*

The characteristics of survey respondents are shown in Table 1. This study included 956 online students, but only 936 data could be processed, comprising 826 female and 110 males at 88.18% and 11.82%, respectively. The associate degree group accounted for 75.11% of respondents (n= 703) in the degree program group. Meanwhile, Nursing students comprised 32.26% of the disciplinary group (n = 302).

*Table 1. Description of respondents' characteristics from each institution (n=936)*

| | Institution | | | | | |
|---|---|---|---|---|---|---|
| Variable | Poltekkes Malang (N=70) n (%) | Poltekkes Medan (N=306) n (%) | Poltekkes Ternate (N=36) n (%) | Poltekkes Riau (N=278) n (%) | Poltekkes Tanjung Karang (N=177) n (%) | Poltekkes Sorong (N=69) n (%) |
| Gender | | | | | | |
| − Female | 60 (85.71) | 276 (90.20) | 32 (88.89) | 248 (89.21) | 151 (85.31) | 59 (85.51) |
| − Male | 10 (14.29) | 30 (9.80) | 4 (11.11) | 30 (10.79) | 26 (14.69) | 10 (14.49) |
| Degree program | | | | | | |
| − Associate degree (3 years) | 35 (50.00) | 237 (77.45) | 36 (100.00) | 278 (100.00) | 117 (66.10) | |
| − Bachelor's degree | 21 (30.00) | 63 (20.59) | | | 21 (11.86) | 67 (97.10) |
| − Profession education* | 14 (20.00) | 6 (1.96) | | | 39 (22.03) | 2 (2.90) |
| Discipline | | | | | | |
| − Nutrition | 16 (22.86) | 50 (16.34) | 7 (19.44) | 93 (33.45) | | |
| − Midwifery | 18 (25.71) | 54 (17.65) | 5 (13.89) | 44 (15.83) | 67 (37.85) | 29 (42.03) |
| − Nursing | 23 (32.86) | 50 (16.34) | 10 (27.78) | 141 (50.72) | 38 (21.47) | 40 (57.97) |
| − Dental Nursing | | 42 (13.73) | | | | |
| − Environment Sanitation | 3 (4.29) | 48 (15.69) | 7 (19.44) | | 29 (16.38) | |
| − Pharmacy | 3 (4.29) | 29 (9.48) | | | 8 (4.52) | |
| − Medical Laboratory Technology | 7 (10.00) | 33 (10.78) | 7 (19.44) | | 35 (19.77) | |
| Number of disciplines involved in one group | | | | | | |
| − Two | | | | | | 69 |
| − Three | | | | 278 | | |
| − Five | | | 36 | | 177 | |
| − Six | 70 | | | | | |
| − Seven | | 306 | | | | |

**After graduate from bachelor degree*

Table 2 describes the average value of each statement on the scale. IGD showed that the average is in the range of 4 and 5 for Strongly Agree. Statements about "I gained a lot of knowledge from group discussions" and "Group discussions have generated new knowledge" yield the highest mean scores. On the RIPLS scale, the average score for each positive statement of items 1 to 9 and 13 to 16 shows an average of above 4, while for negative statements of items 10 to 12 is between 2 and 3, reflecting disagreement with the statement.

Table 2. Mean value and standard deviation of respondents' statements on the Interprofessional Group Discussion (IGD) and Readiness of Learning Interprofessional Scale (RIPLS) scales

| Statements | Mean | SD |
|---|---|---|
| **Scale of Interprofessional Group Discussion (in Bahasa Indonesia)** | | |
| 1. Group organization is excellent | 4.13 | 0.67 |
| 2. Topics of discussion in the group are according to plans | 4.12 | 0.66 |
| 3. Group discussion is well-planned, and no time wasted | 4.03 | 0.77 |
| 4. Group discussion have produced new knowledge | 4.15 | 0.70 |
| 5. Group discussion has made a relevance between the obtained information and the faced problems | 4.14 | 0.67 |
| 6. Group activities encourage collaboration and teamwork | 4.14 | 0.71 |
| 7. Group leadership is supported by facilitator | 4.08 | 0.72 |
| 8. I am aware of the advantageous information obtained from the group discussion | 4.15 | 0.68 |
| 9. I am happy to participate in the group discussion | 4.14 | 0.71 |
| 10. I look forward to the next group discussion | 4.08 | 0.69 |
| 11. I gain a bunch of knowledge from the group discussion | 4.16 | 0.69 |
| 12. I want to explore more about the subject being discussed | 4.13 | 0.68 |
| **Readiness of Interprofessional Learning Scale (in Bahasa Indonesia)** | | |
| 1. Learning with other students/professionals will make me a more effective member of a health and social care team | 4.05 | 1.01 |
| 2. Patients would ultimately benefit if health and social care students worked together | 4.08 | 1.01 |
| 3. Shared learning with other health and social care students students/professionals will increase my ability to understand clinical problems | 4.08 | 1.02 |
| 4. Communications skills should be learned with other health and social care students | 4.04 | 1.02 |
| 5. Team-working skills are vital for all health and social care students to learn | 4.07 | 1.02 |
| 6. Shared learning will help me to understand my own professional limitations | 4.04 | 1.01 |
| 7. Learning between health and social care students before qualification would improve working relationships after qualification/collaborative practice. | 4.07 | 0.99 |
| 8. Shared learning will help me think positively about other health and social care professionals | 4.06 | 1.01 |
| 9. For small group learning to work, students need to respect and trust each other | 4.07 | 1.02 |
| 10. I don't want to waste time learning with other health and social care students | 2.29 | 1.23 |
| 11. It is not necessary for undergraduate health and social care students to study together | 2.59 | 1.34 |
| 12. Clinical problem solving can only be learnt effectively with students from my own school | 2.54 | 1.29 |
| 13. Shared learning with other health and social care professionals will help me to communicate better with patients and other professionals | 4.03 | 1.02 |
| 14. I would welcome the opportunity to work on small group projects with other health and social care students | 4.04 | 1.01 |
| 15. I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health and social care students | 4.03 | 1.01 |
| 16. Shared learning and practice will help me clarify the nature of patients' or clients' problems | 4.03 | 1.01 |

A one-way ANOVA was used to compare the effects of the degree program, discipline, and the number of disciplines involved in one group on IGD and RIPLS scores. Individual differences between groups were assessed using Tuckey's HSD test or Games-Howell comparisons when the homogeneity assumption was not fulfilled.

***Result of a one-way ANOVA and Post-hoc Test of IGD Score and Independent Variables***

An omnibus one-way ANOVA was reported, with post-hoc tests on IGD scores with independent variables. A variant analysis showed a statistically significant difference in the mean IGD score between discipline groups (F (6, 929) = [2.68], p =.014). The mean value of the IGD score among nurses (M = 50.22, SD = 6.57) was significantly higher than nutritionists (M = 48.02, SD = 7.19) with p = 0.026, 95% CI = [.15, 4.25]. There were no statistically significant differences in mean IGD scores when one discipline was paired with another.

A one-way ANOVA analysis of the mean IGD score and the number of disciplines involved in a group indicated a statistically significant difference (F (4, 931) = [12.37], p = <.001). Furthermore, when the

homogeneity of the mean IGD score and the number of disciplines involved did not meet the criteria (p =.05), a Games-Howell test was used. The post-hoc test showed that there are significant pairwise differences in mean IGD score between the "three disciplines" (M = 50.12, SD = 5.78) and the "two disciplines" group (M = 47.07, SD = 6.44) with p =.005, 95% CI = [.69, 5.41]. There was also a significant pairwise difference between the "three disciplines" and "six disciplines" groups (M = 45.71, SD = 9.55), p =.004, 95% CI = [1.08, 7.73]. Post-hoc analysis indicated that the "five disciplines" (M = 51.44, SD = 7.41) outperformed the "two disciplines" (p =.001, 95% CI = [1.70, 7.03]), the "six disciplines" (p =.001, 95% CI). = [3.07, 8.38]), and the "seven disciplines" group (M = 48.82, SD = 7.29 with p =.001, 95% CI = [0.85, 4.39].

Table 3. Bivariate analysis: an omnibus one-way ANOVA and post-hoc tests on IGD and RIPLS scores with independent variables

| Variable | **Interprofessional Group Discussion (IGD)** | | | | | **RIPLS Scale** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | SD | Statistic test | Post Hoc Tuckey-HSD / Games Howell | Mean | SD | Statistic test | Post Hoc Tuckey-HSD / Games Howell |
| Gender | | | | | | | | | |
| – Male | 110 | 49.71 | 7.34 | t= 0.289 | | 58.88 | 11.13 | t= 0.199 | |
| – Female | 826 | 49.40 | 7.20 | p= .677 | | 60.28 | 11.69 | p= .235 | |
| Discipline Group | | | | | | | | | |
| – Nutrition (D) | 166 | 48.02 | 7.19 | F= 2.68 | N>D | 59.08 | 11.94 | F= 2.18 | - |
| – Midwifery (M) | 217 | 50.20 | 7.05 | df= 6 | | 59.76 | 12.77 | df= 6 | |
| – Nursing (N) | 302 | 50.22 | 6.57 | **p= .014** | | 59.24 | 11.91 | **p= .04** | |
| – Dental Nursing (ND) | 42 | 48.17 | 7.89 | | | 60.5 | 8.12 | | |
| – Environment Sanitation (EL) | 87 | 48.75 | 6.41 | | | 62.44 | 9.05 | | |
| – Pharmacy (P) | 40 | 48.10 | 8.50 | | | 61.28 | 11.14 | | |
| – Medical Laboratory Technology (LM) | 82 | 49.48 | 9.08 | | | 63.21 | 10.31 | | |
| Degree Program | | | | | | | | | |
| – Associate degree | 703 | 49.69 | 6.94 | F= 3.01 | - | 59.77 | 11.80 | F= 4.72 | PR>D3 |
| | | | | df= 2 | | | | df= 2 | PR>D4 |
| – Bachelor's degree | 172 | 48.23 | 7.46 | **p= .05** | | 60 | 10.62 | **p= .01** | |
| – Profession education (PR) | 61 | 49.97 | 9.19 | | | 64.51 | 11.61 | | |
| Number of disciplines involved | | | | | | | | | |
| – Two ('2') | 69 | 47.07 | 6.44 | F= 12.37 | ('3') > ('2') | 58.22 | 11.84 | F= 8.87 | ('5') > ('3') |
| – Three ('3') | 278 | 50.12 | 5.78 | df= 4 | ('3') > ('6') | 58.16 | 12.00 | df= 4 | ('6') > ('2') |
| – Five ('5') | 213 | 51.44 | 7.41 | **p= < .001** | ('5') > ('2') | 62.08 | 12.01 | **p= < .001** | ('6') > ('3') |
| – Six ('6') | 70 | 45.71 | 9.55 | | ('5') > ('6') | 66.00 | 9.79 | | ('6') > ('7') |
| – Seven ('7') | 306 | 48.82 | 7.29 | | ('5') > ('7') (Games-Howell) | 59.61 | 10.73 | | |

***Result of an one-way ANOVA and post-hoc test of the RIPLS score and independent variables***

A one-way ANOVA was used between the mean RIPLS score and the variables of a degree program, discipline, and the number of disciplines involved in a group. The result indicated a statistically significant difference in the mean RIPLS score with the degree program (F (2, 933) = [4.72], p =.01). To check for

individual differences between groups, post-hoc comparisons were assessed through Tuckey HSD. The test indicated that the mean RIPLS score for professional education was significantly higher than the group of associate degree group (M = 59.77, SD = 11.80), p = <.001, 95% CI = [.90, 4.34]. Furthermore, pairwise comparisons of means using Tukey's HSD procedure indicated that the group of professional education group has a greater significant difference than the bachelor's degree (*M* = 60,00, *SD* = 10.62), p =.025, 95% CI. = [.46, 8.56].

The results of a one-way ANOVA showed that the mean RIPLS score was significantly different from the discipline group, *F* (6, 929) = [2.18], *p =.04*. However, pairwise comparisons using Tukey's HSD procedure did not indicate a significant difference. Further analysis showed a statistically significant difference in the mean RIPLS score according to the number of disciplines involved in a group (F (4, 931) = [8.87], p =.001). A Tukey post hoc test indicated significant pairwise differences between the "five disciplines" (*M* = 62.08, *SD* = 12.01) and the "three disciplines" groups (*M* = 58.16, *SD* = 12.00), p =.02, 95% CI = [1.08, 6.77]. The "six disciplines" (*M* = 66.00, *SD* = 9.79) showed significant pairwise differences with the "two disciplines" (*M* = 58.22, *SD* = 11.84), the "three disciplines" and the "seven disciplines" groups (M = 59.61, SD = 10.73).

## 4. Discussion

Interprofessional learning is crucial to affecting students' attitudes, behaviors, and competence, particularly in the health and medical fields. Numerous IPE applications' learning techniques, including this simulation, have been extensively documented [27], [28]. However, because this simulation covers a wide range of degrees and professions, putting online interprofessional simulation into practice is challenging. It takes careful planning to combine online IPE learning with various professions or disciplines while combating COVID-19 pandemic. These results are essential for advancing additional IPE learning because it is still considered novel in Indonesia, and there is little experience in conducting online simulations. This study's interprofessional online simulation model impacted students' attitudes toward IPE learning. The attitudes about readiness are strongly affected by the group of disciplines, the level of education, and the number of disciplines involved.

An online interprofessional simulation that used case-based scenarios and involved SPs shows positive and meaningful results in group discussion activities and learning readiness [7], [29]. The combination was also carried out in many studies that showed positive and significant results on readiness for learning, teamwork, and discussion activities in groups [19], [30], [31]. Simulation in learning is a place to practice skills such as applying knowledge, attitudes, and concepts before students try them out in the real world [14], [32].

Participation of SPs in online simulation activities can boost positive outcomes in interprofessional discussions and improve learning readiness [16], [33], [34]. Several simulations have been developed and shown to be effective in developing competence domains [35]–[37]. Similarly, this study created an online learning environment through a case-based learning approach and simultaneously integrating the three learning components, namely tutors, students, and SPs. Furthermore, it yielded a positive result consistent with previous findings [38]–[40]. This online simulation model was created by combining several fairly complex learning strategies [41], [42]. It corresponded to interprofessional processes in which groups form gradually, concurrently, or randomly [43]. Therefore, several confounding factors will affect the interprofessional learning process regarding competence development [44], [45].

In this study, trained SPs participated in OSCE exams, specifically portraying activities during health provider-patients interviews and physical examinations. However, few SPs demonstrated exceptional acting abilities in front of a diverse range of professionals. This creates a one-of-a-kind challenge for developing SPs for interprofessional activities. Multiple studies showed that it takes a significant amount of time and effort to be capable of meeting this need [33], [40], [46]. This study used paid actors or artists to ensure that their acting was consistent and reliable and could change quickly when needed [19].

The post-hoc test analysis of the relationship between the IGD and the RIPLS scores with the independent variables varied widely. The group of students in professional education who were significantly ready for interprofessional learning compared to those with associate and bachelor degrees showed consistent results with several others [47]–[49]. These results were predictable because they are strongly influenced by the education curriculum, where the professional education group provides longer exposure to practice in real settings. Therefore, students in the professional education group often observe, meet, and or interact with

various professionals and various types of practice areas compared to other groups. Based on the results, when students have different levels of education, further investigation is needed to determine the reinforcement of each group. This should be designed for the selection and analysis of scenario cases. In the case scenarios, reinforcement could include adding profession-specific knowledge, interprofessional education, or more components. The findings will be crucial because the number of associate degree graduates is very large and required at most levels of health care, while the number of graduates of professional education, such as nurses, doctors, and pharmacists, is still insufficient.

Further examination of discipline factors in a group with discussion activities and readiness for interprofessional learning yielded significant results. This finding is consistent with previous studies in which the type of discipline influences interprofessional activities, as measured by the RIPLS score [29], [50], [51]. Similarly, the type of discipline influences the discussion process between professions. However, the post-hoc analysis only showed that the pairs that gave significant positive results were between nurses and nutrition professionals on the interprofessional discussion activity score. These results indicated that the nursing and nutrition disciplines differ from the others in the online simulation activity.

The definition of interprofessional education, which states that "*it occurs when two or more professionals learn about, from, and with each other to enable effective collaboration and improve health outcomes*", raises a question: "How many types of professions are in one group that will result in effective collaboration?" This study showed that the one-way ANOVA test indicated significant results for the number of professions involved on both scales. Multicomparison with post-hoc on both scales shows a pattern of different pairs significantly influencing the scores of the two scales. On interprofessional discussion activities, pairs between three and five disciplines in one group gave higher scores and significantly differed from the others. Meanwhile, the RIPLS score indicates that couples with five to six disciplines produce positive and meaningful results compared to others. Several studies also examined how the diversity of professions affects readiness and discussion activities. According to Lairamore et al. (2017), team composition influences students' perception of interprofessional teamwork and collaboration [52]. The findings are consistent with those of previous research, which found that team composition led to significant positive outcomes [28], [53], [54]. This study produced several variations in team composition that yielded significant positive results, including three, five, and six different professions. The results are important for preparing for the application of interprofessional learning or practice in a team setting [52], [55]. Therefore, effective collaboration can be achieved, and interprofessional conflicts can be reduced.

***Strengths and Limitations***

The findings are inextricably linked to several shortcomings that should be addressed. The composition of profession types within each group varies due to the different student populations, creating a research problem. This study adhered to the IPE principles for each group of two or more professions. Some research assumptions proved difficult to meet, such as the disproportionate allocation of respondents based on disciplines. The insecure Internet network posed the most significant impediment to this activity. During the planning phase, each institution had prepared an appropriate number and proportion of students from each discipline. However, when the internet network went down, the group's members changed, which could make it difficult for professionals from different fields to talk to each other [56].

***Implications for Practice***

This model can instantly achieve the goal of interprofessional learning, particularly in students' readiness for discussion activities. The findings can be strengthened when the immersion phase is continued in real-world settings, such as community or hospital practice. This is because the simulation used two approaches, namely case-based simulation, and SPs, ensuring that students are prepared to practice in real-world settings. As COVID-19 pandemic conditions improve, face-to-face applications (offline) can produce more diverse results. Institutions can start developing programs to acquire high-quality SPs resources. Furthermore, more studies are needed to pinpoint the factors influencing student attitudes toward interprofessional learning. The strategies, number, and composition of lecturers and students involved in various professions, online and offline activities, and learning locations are all at stake. The results are immediate, whereas longitudinal research is still limited. Therefore, there is limited information about how research findings affect students learning. More testing is needed, focusing on psychomotor assessment using the Miller pyramid [57] and the level of IPE learning [9].

## 5. Conclusion

Interprofessional learning is a complex process that requires several components to be implemented within the curriculum. This study applied simulations with case-based scenarios and SPs to demonstrate the benefits of synchronous learning. Furthermore, professional type, education level, and the number of professions significantly impact attitudes toward readiness for interprofessional learning and group discussions. The complexity of interprofessional learning includes systematically analyzing pedagogical ideas that use several parts to speed up competence.

## 6. References


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