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A Comparative Study of Face-to-Face and Online Interprofessional Education Models for Nursing Students in Japan: A Cross-Sectional Survey

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Abstract: This study investigated the effects of an online interprofessional education (IPE) program on nursing students at a university in Japan. It conducted a comparative analysis between traditional face-to-face and online interventions. All students who enrolled in the "Team Medical Practice" course in both 2019 and 2020 were invited to participate. After team-based learning with different healthcare professions, we quantitatively analyzed pre- and post-intervention outcomes using two measures: the Readiness for Interprofessional Learning Scale (RIPLS) and the IPE Questionnaire TSUKUBA model (IPET). We compared the results of 153 nursing students. The RIPLS results demonstrate significant pre- and post-intervention score differences in the teamwork and collaboration subscale for the online group only. The post-IPE score analysis revealed that scores were significantly higher in the online group in all subscales: Teamwork and collaboration, Opportunities for IPE, and Uniqueness of profession. Based on the IPET results, there were no significant differences in pre- and post-intervention scores. However, the online group showed a significant increase in post-intervention scores in participation in group work, thoughts about the team in health and welfare, and thoughts about interprofessional collaboration. These findings indicate that the online IPE program improved nursing students' readiness for interprofessional learning, demonstrating practical efficacy.

Keywords: interprofessional education; in-person; virtual; nursing students; team-based learning

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1. Introduction

In Japan and around the world, there is a growing demand to incorporate changes in the population structure, which includes aging; social structures, which include work patterns; disease structure supported by medical technology; and people's values and ideologies, into healthcare policies. In the face of diverse needs, the goal is to extend the healthy lifespan of all individuals and create a prosperous society using limited resources. To achieve this, it is essential to have a mechanism for interprofessional work in which stakeholders from various fields come together, use a common language, stand on the same ground, and discuss and implement health and healthcare policies. Currently, the importance and necessity of interprofessional education (IPE) are increasing, as it is essential to cultivate multidisciplinary professionals who will drive interprofessional work.

The global health crisis stemming from coronavirus disease 2019 (COVID-19) has altered the methods by which education is delivered. Many institutions have responded to this crisis by offering online classes and similar types of training. There is also a demand for IPE and collaboration programs, especially following the recent diversification of diseases and the increasing complexity of medical care. Consequently, high-quality expertise and

team-based medicine are needed to allow collaborators from diverse fields to share their knowledge and skills.

The National Academy of Medicine [1] stated that diagnostic errors remain a problem across healthcare settings and recommended improvements in interprofessional collaboration and teamwork in healthcare. Similarly, scholars have called for education programs to train health professionals to work as members of a team [2] and elaborated on the importance of teamwork for clinical reasoning [3,4].

In this context, universities around the world are introducing IPE programs [5] that can enhance students' knowledge of patient care. In contrast to the desk-based study format, IPE employs active learning. This approach helps students learn experientially and independently, thereby promoting interprofessional understanding and collaboration. There are various advantages for learning outcomes, including improved team communication skills. Many universities in Japan are now implementing active learning, or team-based learning (TBL), through multidisciplinary cooperative education programs [6,7]. TBL activities promote the importance of teamwork in clinical nursing practice [8].

TBL is based on active learning [9–11] and is described as a constructive process in which students utilize their knowledge and group interaction to pass tests and solve problems. Operationally, the learning process comprises seven phases and requires students to pass three types of tests: an individual test (Individual Readiness Assurance Test; iRAT), a similar test but with a team (Team RAT; tRAT), and a practical exercise that is always performed in teams (Team Application). This process is influenced by factors such as student responses and attitudes, in which engagement is important and contributes to the achievement of learning outcomes [12].

At the university where this study was conducted, the Medicine and Health Sciences departments offered IPE with TBL four times via the classes "Basic Clinical Integration I" (two credits), required for second-year medical students, and "Team Medical Practice" (one credit), required for third-year nursing students affiliated with the School of Health Sciences. Joint exercises have been conducted with students beginning in the 2018 academic year.

While there are clear advantages, there are also many barriers to the implementation of IPE. In particular, it is challenging to (1) schedule a common time for collaboration between multiple faculties and departments, (2) build a management system to handle the large-scale nature of the program, (3) ensure facilitation by faculty members, and 4) accumulate evidence for educational effectiveness [13].

In addition, the COVID-19 pandemic limited the potential for traditional face-to-face learning, pressuring instructors and healthcare providers to explore innovative ways of delivering IPE programs through online channels. Owing to the rapid transition to online learning, higher education institutions had to adapt established interprofessional learning (IPL) environments to online formats on an improvised basis [14]. Since the transformation of team functioning into an online environment was largely unknown, this posed numerous challenges [15]. There is limited prior research comparing in-person and online IPE events, and the results are mixed. In one study, when transitioning IPE student simulations from in-person to online, higher IPE skills were observed compared to previous in-person simulations. Additionally, all student learning outcomes were achieved, indicating the effectiveness of virtual IPE simulation education [16]. In a prior study comparing the cognitive effects of in-person and virtual remote debriefing, remote IPE debriefing was less effective than in-person IPE debriefing but proved to be a viable option when in-person IPE debriefing opportunities were unavailable [17]. Research on facilitation strategies used in synchronous and asynchronous IPE experiences revealed that students and facilitators perceived previously recognized facilitation strategies in asynchronous and in-person IPE environments to be utilized in online synchronous environments as well [18]. The purpose of the study is to evaluate the outcomes of an online IPE intervention (remote education model) compared with a face-to-face IPE format (conventional education model).

2. Materials and Methods

2.1. Design, Programs, and Participants

We adopted an observational comparative design, employing both traditional face-to-face and online education models. All students who enrolled in the "Team Medical Practice" course (one credit)—required for third-year nursing students—in both 2019 and 2020 were invited to participate in a survey. The survey was administered twice, voluntarily, before and after the commencement of the IPE joint classes. Participants accessed the questionnaire by logging into the academic information system and providing their responses through an online interface. The initial sample comprised approximately 160 nursing students who were participants in IPE sessions held in 2019 and 2020 (80 third-year students from each year). All were with the department of nursing, had registered for Theory of Team Medical Practice, and had participated in the joint seminar during the 2019–2020 academic year.

2.2. Implementation Method

A TBL method used in a previous study [19] was employed in the IPE sessions. The students were organized into 20 mixed groups, each comprising 10–11 members (six–seven medical students and four nursing students). The nursing students were placed in 20 groups of four students each. Group formations were presented prior to the class.

From late June to mid-July, four 90-min IPE sessions were conducted for each of the required participants in the medical and nursing programs. The related learning content, specialized terminology, and cases were provided to students as learning assignments two weeks prior to the first IPE session.

In the first session, self-introductions were conducted, and guidance was provided to the groups. Subsequently, a set of 20 questions for both the iRAT and tRAT were administered. The tests were designed to assess students' preparedness for the following session. The content of the iRAT and tRAT was identical; however, the iRAT was completed individually, while the tRAT was conducted in teams immediately after the iRAT. The tRAT allowed students to discuss their responses and teach each other, facilitating TBL. These readiness assurance tests were developed after faculty discussions on content related to interprofessional collaboration in the latest national medical and nursing licensure examinations. All answers were explained by local instructors.

In the second session, two case studies were presented to the groups, and one of them was selected as the focus of group work. Case 1 involved a case study on "Gastrostomy in the Elderly," in which the patient did not wish to have a gastrostomy despite being unable to take oral intake, while the family desired that the gastrostomy be conducted. Case 2 focused on a case study of "Pediatric Brain Tumor," involving a school-age patient with a newly discovered recurrent brain tumor who wished to be discharged but required a tracheotomy owing to his condition. The patient's family was unsure whether to discuss the recurrence with him. Faculty members acting as facilitators guided each group through the discussion points. To prepare their presentations, the students in each group discussed their chosen case, addressing topics such as professional roles, necessary information, and reasons, and proposing a treatment plan.

During the third session, held two weeks later, mini presentations took place among groups that had selected the same case study. They answered questions and received inquiries, and a representative group was selected from among those using the same case study.

All students gathered in the fourth session, and the groups selected during the third session gave their presentations and answered questions.

The evaluations of the presentations were based on both the content and the final reports for both the face-to-face and online groups. In addition to faculty evaluations, peer evaluations were also conducted among students only in the online group to assess their level of participation and motivation to learn using a predefined rubric (Supplementary Table S1). Although the IPE content was similar in both the face-to-face and online groups, the online education model was conducted remotely using Zoom. In the

online group, Zoom breakout rooms were used to facilitate group work, with each breakout room being monitored by a designated faculty member. Discussions held outside of class time were facilitated using Microsoft Teams software (Ver. 4.9.12.0) as a collaboration platform on a case-by-case basis. The iRAT and tRAT were administered online using a learning management system for both the face-to-face and online groups, allowing for real-time feedback through the review of all responses.

2.3. Survey Scales and Items

Questionnaires were administered before and after the multi-professional collaboration joint seminar to evaluate the effects of the IPE. We asked all students to complete two questionnaires; however, we respected the wishes of any who did not want their data or responses to be used for research purposes. Both instruments were used with the developers' permission.

2.3.1. Readiness for IPL Scale, Japanese Version (RIPLS)

The RIPLS was developed to measure IPE readiness, attitudes toward IPE, and the effects of IPE on undergraduate education [20]. The RIPLS is one of the most commonly used outcome measures in IPE events, as it allows for the assessment of attitudes, beliefs, and preparedness for interacting with other students during shared learning experiences among healthcare professional students. We adopted the RIPLS because, while there are doubts about the robustness of its subscales [21], its overall consistency is suitable across various cultural backgrounds [22–24]. Moreover, the reliability of the RIPLS total score has consistently demonstrated high reliability [25].

The student version of the RIPLS is internationally recognized as the most widely cited scale for measuring readiness for IPE. However, its usage has been primarily limited to Western countries. Outside the Western context, the student version has been translated and used in countries such as the United Arab Emirates and Japan. We used the Japanese version of the scale (Supplementary Table S2), which comprises 19 items with confirmed internal consistency [26]. The RIPLS has three subscales: Teamwork and collaboration (thirteen items), Opportunities for IPE (two items), and Uniqueness of profession (four items). The items are measured on a five-point Likert scale ranging from "strongly agree" to "strongly disagree." The RIPLS score includes five reverse-scored items and reflects the readiness for IPE among healthcare professionals. Therefore, a higher total score on the RIPLS in this study indicates a greater readiness for IPL among undergraduate healthcare students.

2.3.2. IPE Questionnaire: TSUKUBA Model (IPET)

The IPET (Supplementary Table S3) measures attitudes toward IPE among medical college students. We used a validated instrument [7], which was modified from the original version and consisted of 40 items [27] across five domains. The five domains were as follows: (1) feelings about the profession I am training for (eight items); (2) understanding the role of each profession's specialization (ten items); (3) thoughts regarding participation in group work (six items); (4) thoughts regarding the team in healthcare and welfare (ten items); and (5) feelings about cooperation among different professions (four items). Each item was rated using a Likert scale with six levels: 1 (strongly disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (somewhat agree), 5 (agree), and 6 (strongly agree).

2.4. Reliability and Validity

The reliability and validity of the Japanese versions of the RIPLS and IPET were confirmed in a previous study (Cronbach's αs = 0.880 and 0.956, respectively) [7].

2.5. Statistical Analysis and Ethical Considerations

Descriptive statistics were used for the basic attributes. Data cleaning included reverse scoring (items 14–18; Supplementary Table S1) and excluded incomplete data. For both the face-to-face and online groups, we calculated the mean total RIPLS/IPET scores at

two points (i.e., before and after IPE) and performed comparisons using the Wilcoxon signed-rank test. As we used the RIPLS to measure readiness for IPE, we also used it for comparison between the face-to-face and online groups via the Mann–Whitney U test. SPSS Statistics 19 (IBM Corp., Armonk, NY, USA) was used to perform these analyses.

We determined the sample size based on a previous study [28], which was 34 in each group with a significance level (two-sided) of $\alpha = 0.05$ and a statistical power of $1 - \beta = 0.08$.

2.6. Ethical Considerations

The study purpose, the consent process, and the method of withdrawal were explained to students in writing. Participants were assured that the content of their responses in the questionnaire would not affect their academic performance. Clicking "Consent" on the initial page of the online survey was considered to indicate each student's consent. This study has been approved by the Ethics Committee of the Niigata University School of Medicine (no. 2020-0111).

3. Results

Of the 160 nursing students, 153 agreed to participate and completed the pre- and post-test questionnaires (response rate of 95.6%; Table 1).

Table 1. Participant characteristics.

	Face-to-Face (2019)		Online (2020)	
	n	**%**	***n***	**%**
3rd-year nursing students	76	49.6	77	50.3

3.1. Comparison of RIPLS Scores

Table 2 shows a comparison of the RIPLS scores between the face-to-face group and the online group. When comparing the scores before and after the IPE, there was a significant difference in the mean total score for the online group (face-to-face: $p = 0.153$, $d = 0.17$, online: $p = 0.001$, $d = 0.34$). When comparing the scores of the subscales before and after the IPE, both groups show a significant increase in subscale 2, "Opportunities for IPE," after the IPE (face-to-face: $p = 0.004$, $d = 0.28$, online: $p = 0.053$, $d = 0.18$). However, only the online group shows a significant increase in subscale 1, "Teamwork and Collaboration", after the IPE (face-to-face: $p = 0.558$, $d = 0.04$, online: $p = 0.008$, $d = 0.69$).

Table 2. Comparing RIPLS scores before and after face-to-face and online education.

		Face-to-Face					Online				
		Pre-Test		Post-Test			Pre-Test		Post-Test		
Subscale	**Score Range**	**Mean**	**SD**	**Mean**	**SD**	***p***	**Mean**	**SD**	**Mean**	**SD**	***p***
Scale 1: Teamwork and collaboration (13 items)	(1–65)	51.6	6.7	51.9	8.9	0.558	52.8	6.2	54.7	6.6	0.008
Scale 2: IPE opportunities (2 items)	(1–10)	6.6	2.2	7.3	2.8	0.004	7.9	1.5	8.2	1.8	0.053
Scale 3: Uniqueness of profession (4 items)	(1–20)	12.9	1.8	13.5	2.9	0.108	14.0	1.7	14.4	2.3	0.068
RIPLS total score	(1–95)	71.2	7.5	72.7	10.1	0.153	74.7	7.8	77.3	7.7	0.001

Wilcoxon signed-rank test; Response options ranged from 1 = lowest degree of endorsing the factor content to 5 = highest degree of endorsing the factor content; RIPLS: Readiness for Interprofessional Learning Scale; SD: standard deviation; IPE: interprofessional education.

A comparison of the changes in scores before and after IPE between the face-to-face and online groups show no significant differences in subscale 3, "Uniqueness of the profession" (face-to-face: $p = 0.108$, $d = 0.25$, online: $p = 0.068$, $d = 0.2$).

Table 3 shows a comparison of RIPLS scores between the online and face-to-face groups before and after IPE. Analysis of pre-IPE scores revealed that the score for subscale 2, "Opportunities for IPE" (face-to-face: mean score 6.6 vs. online: mean score 7.9; $p = 0.001$, $d = 0.69$), and the total RIPLS score (face-to-face: mean score 71.2 vs. online: mean score 74.7; $p = 0.013$, $d = 0.46$) were significantly higher in the online group. In post-IPE score analysis, the online group shows significantly higher scores in all subscales, including subscale 1, "Teamwork and collaboration" (face-to-face: mean score 51.9 vs. online: mean score 54.7; $p = 0.048$, $d = 0.36$), subscale 2, "Opportunities for IPE" (face-to-face: mean score 7.3 vs. online: mean score 8.2; $p = 0.002$, $d = 0.38$), and subscale 3, "Uniqueness of profession" (face-to-face: mean score 13.5 vs. online mean score 14.4; $p = 0.046$, $d = 0.34$), as well as a higher total RIPLS score (face-to-face: mean score 72.7 vs. online mean score: 77.3; $p = 0.001$, $d = 0.51$).

Table 3. Comparing face-to-face and online education: pre- and post-RIPLS scores.

		Pre-Test					**Post-Test**				
		Face-to-Face		**Online**			**Face-to-Face**		**Online**		
		***n* = 76**		***n* = 77**			***n* = 76**		***n* = 77**		
Subscale	**Score Range**	**Mean**	**SD**	**Mean**	**SD**	***p***	**Mean**	**SD**	**Mean**	**SD**	***p***
Scale 1: Teamwork and collaboration (13 items)	(1–65)	51.6	6.7	52.8	6.2	0.477	51.9	8.9	54.7	6.6	0.048
Scale 2: IPE opportunities (2 items)	(1–10)	6.6	2.2	7.9	1.5	0.001	7.3	2.8	8.2	1.8	0.002
Scale 3: Uniqueness of profession (4 items)	(1–20)	12.9	1.8	14.0	1.7	0.749	13.5	2.9	14.4	2.3	0.046
RIPLS total score	(1–95)	71.2	7.5	74.7	7.8	0.013	72.7	10.1	77.3	7.7	0.001

Mann–Whitney U test; Response options ranged from 1 = lowest degree of endorsing the factor content to 5 = highest degree of endorsing the factor content; RIPLS: Readiness for Interprofessional Learning Scale; SD: standard deviation; IPE: interprofessional education.

3.2. Comparison of IPET Scores

Table 4 shows a comparison of the IPET scores before and after IPE in both the face-to-face education model and the online education model. A comparison of the face-to-face and online groups revealed that there were no significant differences in scores for Domain 1 (items measuring students' feelings toward the profession they were being trained for) before and after the implementation of IPE. After IPE, both groups show significant score increases in the following domains: Domain 2 (items related to understanding the role of each profession's specialization; face-to-face: $p = 0.01$; online: $p = 0.001$), Domain 4 (items related to the team in health and welfare; face-to-face: $p = 0.001$; online: $p = 0.001$), and Domain 5 (items related to cooperation among different professions; face-to-face: $p = 0.001$; online: $p = 0.001$). However, only the online group demonstrates a significant increase in the IPET score in Domain 3 (items related to participation in group work; $p = 0.001$).

Table 5 shows a comparison between the pre- and post-test scores of the face-to-face and online groups. A comparison of pre-test scores demonstrated that there were no significant differences between the two groups in any domain. However, in the post-test score comparison, the online group had significantly higher scores compared with those of the face-to-face group in Domain 3 (items related to participation in group work; face-to-face mean score: 40.5 vs. online mean score: 42.1; $p = 0.02$), Domain 4 (items related to the team in health and welfare; face-to-face: mean score 56.3 vs. online mean score: 60.1; $p = 0.001$), and Domain 5 (items related to cooperation among different professions; face-to-face mean score: 24.4 vs. online mean score > 26.2; $p = 0.001$).

Table 4. Comparing IPET scores before and after face-to-face and online education.

		Face-to-Face					Online				
	Score Range	Pre-Test		Post-Test			Pre-Test		Post-Test		
		Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
Domain 1: Feelings about the profession I am training for (8 items)	(1–48)	30.9	7.0	31.5	7.6	0.50	31.4	6.8	32.5	8.1	0.06
Domain 2: Understanding the role of each profession's specialization (10 items)	(1–60)	37.8	9.0	40.5	8.9	0.01	37.5	6.7	42.1	7.0	0.001
Domain 3: Regarding participation in groupwork (6 items)	(1–36)	28.2	3.5	40.5	8.9	0.21	27.5	3.5	42.1	7.0	0.001
Domain 4: Thoughts regarding the team in healthcare and welfare (10 items)	(1–60)	50.0	15.1	56.3	7.8	0.001	53.5	5.4	60.1	5.6	0.001
Domain 5: Feelings about cooperation among different professions (4 items)	(1–24)	19.7	3.0	24.4	3.9	0.001	20.5	2.4	26.2	2.8	0.001

Wilcoxon signed-rank test; Response options ranged from 1 = lowest degree of endorsing the factor content to 6 = highest degree of endorsing the factor content; IPET: interprofessional education questionnaire TSUKUBA model; SD: standard deviation.

Table 5. Comparing face-to-face and online education: pre-and post-IPET scores.

		Pre-Test					Post-Test				
		Face-to-Face		Online			Face-to-Face		Online		
	Score Range	*n* = 76		*n* = 77			*n* = 76		*n* = 77		
		Mean	SD	Mean	SD	*p*	Mean	SD	Mean	SD	*p*
Domain 1: Feelings about the profession I am training for (8 items)	(1–48)	30.9	7.0	31.4	6.8	0.42	31.5	7.6	32.5	8.1	0.31
Domain 2: Understanding the role of each profession's specialization (10 items)	(1–60)	37.8	9.0	37.5	6.7	0.98	40.5	8.9	42.1	7.0	0.14
Domain 3: Regarding participation in groupwork (6 items)	(1–36)	28.2	3.5	27.5	3.5	0.18	40.5	8.9	42.1	7.0	0.02
Domain 4: Thoughts regarding the team in healthcare and welfare (10 items)	(1–60)	50.0	15.1	53.5	5.4	0.91	56.3	7.8	60.1	5.6	0.001
Domain 5: Feelings about cooperation among different professions (4 items)	(1–24)	19.7	3.0	20.5	2.4	0.12	24.4	3.9	26.2	2.8	0.001

Mann-Whitney U test: Response options ranged from 1 = lowest degree of endorsing the factor content to 6 = highest degree of endorsing the factor content; IPET: interprofessional education questionnaire TSUKUBA model; SD: standard deviation.

4. Discussion

This study evaluated the outcomes of an online IPE intervention (remote education model) compared with a face-to-face IPE format (conventional education model). The results indicate that both the face-to-face and online groups experienced positive outcomes from IPE, with the online group specifically showing higher scores in various domains related to teamwork, collaboration, and participation in group work.

Online education provides access to programs for individuals who cannot attend in-person classes. Even before the emergence of COVID-19, various higher and professional education institutions were in the process of transitioning to online environments. With the onset of the pandemic, a significant portion of coursework and clinical training programs rapidly shifted to online delivery methods. However, there is inconsistency in the implementation of e-learning tools across different healthcare professions and countries [29]. Recent studies have suggested that mobile applications and virtual hospitals are well-received by students [29–31]. Moreover, when implemented correctly, e-learning can enhance teaching and learning methods in clinical programs [20]. Accordingly, this raises the question of whether IPE can be effectively conducted in an online environment and whether it is beneficial for training practitioners.

The results of the RIPLS demonstrate the positive outcomes of IPE, even in an online environment. In a previous study utilizing a mixed-methods approach that implemented and delivered IPE programs in online education, data analysis was conducted on all four subscales of the RIPLS. The findings suggested that students had a positive perception of teamwork and collaboration and valued the opportunities for collaborative learning with other healthcare students. Qualitative data analysis further indicated that IPE increased the awareness of team members' roles, enhanced communication and collaboration, and contributed to better care for COVID-19 patients [32]. In a previous study that evaluated the readiness for IPE conducted online targeting healthcare students in Indonesia, explorations of the perceived competency identity scores for IPE competencies revealed a higher number of positive perceptions [33]. In our study, the post-IPE scores of the online group were significantly higher in all subscales of the RIPLS, suggesting a positive educational effect of online IPE sessions. Our results align with previous studies, showing that all participants exhibited positive perceptions of IPE [34,35].

The results of the IPE Attitude Test (IPET), assessing the attitudes of healthcare students toward IPE, show that the online group exhibits a significant increase in post-IPE scores in Domains 3–5. These domains pertain to the necessity of teamwork, group work, and collaboration among different healthcare professions. Evans et al. reported the effectiveness of online IPE in improving student attitudes and knowledge related to interprofessional practice [36]. Additionally, while some students might have initially faced barriers owing to limited experience with online education, there are advantages such as the potential for active discussions and effective time utilization, which can contribute to positive outcomes [37]. Our study aligns with these previous findings.

Another factor contributing to the increase in IPET scores could be the implementation of peer assessment as part of the IPE program evaluation, exclusively in the online group. This might have motivated students to evaluate themselves and be evaluated by peers, fostering a proactive engagement in group work and collaborative activities and enhancing their motivation to learn. Consequently, the utilization of online communication tools like Zoom and Teams could have facilitated effective interaction between faculty and students, as well as among students themselves. Even in an online setting, providing an environment for interaction along with clear instructions and tasks could potentially surpass the learning efficiency of face-to-face instruction. With the increasing prevalence of online healthcare, including telemedicine, online IPE is expected to become a valuable experience for students. Constructing such an online IPE program requires thorough discussions among faculty members through web conferencing beforehand, as well as a high level of collaboration among interdisciplinary experts within the IPE team [38–40].

Despite challenges such as faculty unfamiliarity and time allocation [41], it has been revealed that interactive online IPE is feasible. Although there is a need for further research to identify the most effective online teaching and learning tools, the importance of follow-up programs for graduates as they enter their professional careers cannot be overlooked. While questioning whether higher education after COVID-19 should fully return to the pre-pandemic state, it is important to explore a form that combines the strengths of in-person and synchronous remote learning. There is a possibility that online IPE has a higher

educational impact than initially anticipated. By gaining experience in online IPE, there is potential to promote the activation of IPE in remote locations worldwide, including the possibility of revitalizing it globally. The requirement for the transition to online classes owing to the COVID-19 pandemic goes beyond the scope of previous studies on online education. Rather than focusing solely on enhancing efficiency, the aim is to make online classes comparable to face-to-face instruction. Adopting a positive approach that recognizes the unique opportunities afforded by online learning could open up new possibilities for future education.

This study does have some limitations. First, it is a one-year questionnaire survey and cannot simply be compared with similar studies on face-to-face and online IPE. As such, the results do not independently confirm whether the educational effects are the same for both types of IPE. Second, post-IPE increases in the total RIPLS score could be attributed to knowledge of the TBL class and/or the group itself. Third, all participants were students from the same university, which could limit generalizability. Further, research is needed to determine if the results are the same or different across wider geographical areas and other cultural contexts. Fourth, we cannot rule out the possibility that the proportion of students in each occupation could affect the outcomes of IPE. To our knowledge, no study has determined the optimal ratio of students in each occupation. Although our findings suggest that collaborations among different professions could be an important factor in helping medical and nursing students improve their readiness for IPL, the optimal student ratio cannot currently be established. Finally, the survey was a self-reported measure, which could have caused a response bias.

5. Conclusions

An evaluation of the results of the face-to-face IPE format (conventional education model) and the online IPE intervention (remote education model) revealed that both the face-to-face group and the online group obtained positive outcomes from IPE. Specifically, the online group demonstrates higher scores in various domains related to teamwork, collaboration, and participation in group work. The results of the RIPLS indicate that the post-IPE scores of the online group were significantly higher in all subscales of the RIPLS, suggesting the positive educational effects of online IPE sessions. In the IPET, the online group shows increased post-intervention scores in domains related to teamwork, group work, and collaboration among different professions. These findings suggest that understanding the importance of team members, fulfilling their respective roles, and working together toward team achievements can be effectively realized even in online IPE. By adopting a positive approach that recognizes the unique opportunities provided by online learning, new possibilities for future education can be opened up.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/educsci13090937/s1, Table S1: Peer Evaluation Rubric [42]; Table S2: RIPLS Japanese version; Table S3: Items for IPET.

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