Jurnal Pemberdayaan Masyarakat
Volume 5 Issue 2 Year 2026 | Pages 483–492
ykgm.org

E-ISSN 2962-8091
DOI: https://doi.org/10.46843/jpm.v5i2.471

Effect of Interprofessional Education (IPE) on Healthcare Students

Ismonah[1]*, Ellyzabeth Sukmawati[1], Achmad Solechan[1], Di Huang[2]
[1]Universitas Telogorejo Semarang, Semarang, Indonesia
[2]Buddhist Tzu Chi Medical Foundation Hualien, Hualien, Taiwan

ABSTRACT

Interprofessional Education (IPE) is increasingly used to prepare healthcare students to work collaboratively in complex healthcare systems. However, evidence on its effectiveness in improving both collaborative attitudes and interprofessional competence remains inconsistent. This study examined the effect of IPE on students' attitudes toward interprofessional collaboration and their interprofessional competence using a quantitative one-group pretest-posttest design. A total of 110 healthcare students participated in a structured IPE program that included collaborative case-based learning and interdisciplinary discussion. Data were collected using validated self-administered questionnaires before and after the intervention. Because the data were not normally distributed, the Wilcoxon signed-rank test was used for analysis. The findings showed a significant improvement in students' attitudes after the IPE program ($p < 0.05$). Interprofessional competence did not change significantly ($p > 0.05$). These results indicate that short-term IPE may be more effective at developing positive attitudes than at building measurable competence. Longitudinal, practice-integrated IPE programs are therefore recommended to support sustainable competence development in.

ARTICLE INFORMATION

Keywords:
healthcare students; interprofessional education; IPE; Nursing

Correspondent Author:
Ismonah

Email:
ismonah@universitastelogorejo.ac.id

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Article info: Submitted: 2025-06-11 | Revised: 2026-04-06 | Accepted: 2026-05-25 | Published: 2026-06-12
Recommended citation: Ismonah., Sukmawati, E., Solechan, A., & Huang, D. (2026). Effect of Interprofessional Education (IPE) on Healthcare Students. *Jurnal Pemberdayaan Masyarakat, 5*(2), 483-492.

INTRODUCTION

Interprofessional collaboration is essential for improving the quality, safety, and continuity of healthcare. This priority aligns with Sustainable Development Goal 3, which emphasizes good health and well-being through effective health services. As healthcare systems become more complex, students in health professions need early preparation to work with other disciplines. Interprofessional Education (IPE) is one educational strategy that helps students from different health professions learn with, from, and about one another. Through this approach, students can better understand professional roles, communicate more effectively, and make shared decisions in patient care (Al-Jayyousi et al., 2021; McKinnon et al., 2022; O'Leary et al., 2020).

Although IPE has been widely studied, its outcomes remain inconsistent across educational settings. Differences in curriculum design, program duration, teaching methods, assessment tools, and the professions involved may influence the results. Several studies have reported that IPE improves collaborative attitudes, communication, and understanding of professional roles (Saragih et al., 2024; Swinnen et al., 2021). However, other studies have shown limited or non-significant effects, especially for measurable competence and long-term clinical performance (Allvin et al., 2020; Straub et al., 2020). These mixed findings indicate that the impact of IPE should be interpreted within its educational and methodological context. Short, theory-based programs may improve knowledge and attitudes, but they may not be sufficient to change behavior or develop competence (Lunde et al.,

2021). In contrast, IPE programs that include simulation, clinical immersion, and repeated exposure tend to produce stronger collaborative outcomes (Saragih et al., 2024). Therefore, context-sensitive evaluation is needed to clarify how IPE contributes to health professions education and to identify instructional components that support sustainable interprofessional collaboration (Ogata et al., 2021).

Collaboration among health professionals is a key factor in improving patient care. Healthcare quality depends not only on the individual expertise of each professional but also on professionals' ability to work together as a team (Melkamu et al., 2020; Opele, 2022). In practice, interprofessional collaboration is often limited by ineffective communication, unclear role boundaries, professional hierarchy, and limited understanding of other disciplines (Sharif et al., 2024; Stewart & Oniel Deans, 2021). These barriers show the need for educational strategies that build collaborative skills from the early stages of professional training (Jung et al., 2020; Seidlein et al., 2022; Uslu-Sahan & Terzioglu, 2020).

IPE provides opportunities for students from different health disciplines to learn together and develop a shared understanding of collaborative practice (Hamada et al., 2020; Wang et al., 2019). The World Health Organization has recommended IPE as an important strategy for strengthening teamwork in healthcare. Effective IPE is expected to improve service quality, support patient safety, and prepare future health professionals for collaborative practice (Makino et al., 2022; Muñoz-Rubilar et al., 2020). Previous studies have shown that IPE can improve students' understanding of professional roles, readiness for teamwork, communication among healthcare professionals, and collaborative practice in clinical contexts (Makino et al., 2022; Seidlein et al., 2022). These outcomes are important for improving patient-centered care. However, IPE implementation still faces several challenges, including differences in curricula across professions, limited resources, time constraints, a lack of financial support, and resistance from students and faculty (Ferreira et al., 2023; Seidlein et al., 2022). Therefore, evaluation is needed to determine whether IPE improves students' readiness, knowledge, attitudes, and interprofessional competence.

The increasing complexity of patient needs makes interprofessional collaboration more important than ever. However, health professions education is often still delivered in separate disciplinary programs, with limited opportunities for students to interact meaningfully across professions. This lack of early collaborative exposure can contribute to poor teamwork, communication errors, and risks to patient safety. Although many studies have examined IPE, their findings are not always consistent and may not be generalizable across institutions, professions, or educational contexts. The novelty of this study lies in its focus on distinguishing the effect of IPE on two different outcomes: collaborative attitudes and measurable interprofessional competence. Using a quantitative pretest-posttest design, this study provides empirical evidence that improvement in collaborative attitudes does not automatically lead to competence development, particularly in short-term educational interventions. The findings have practical value for curriculum developers, policymakers, and educators who design IPE programs. Short-term or theory-dominant IPE may successfully foster positive collaborative attitudes, but stronger clinical integration, longer exposure, and competency-based assessment are needed to support competence development. Therefore, this study provides evidence for redesigning IPE toward practice-integrated, outcome-oriented models. Strengthening IPE design is important to prepare healthcare graduates who are not only collaborative in mindset but also competent in interdisciplinary clinical practice. This preparation is expected to contribute to better healthcare quality and patient-centered service delivery.

METHOD

This study used a quantitative, one-group pretest-posttest design to examine the effect of Interprofessional Education (IPE) on students' attitudes and interprofessional competence. This design was selected because it allows the measurement of changes in the same participants before and after the intervention. The pretest and posttest scores were compared to determine whether the IPE program produced measurable differences in the study outcomes. A total of 110 healthcare students participated in this study. Participants were recruited from health professional programs involved in the IPE implementation. The inclusion criteria were active enrolment in the program and full participation in both pretest and posttest assessments. The IPE program was conducted in an academic setting involving students from several health disciplines. This intervention used IPE to strengthen collaborative competencies in healthcare education (Fusco et al., 2021; Makino et al., 2022; Nadarajah et al., 2021).

The IPE intervention consisted of structured interprofessional learning sessions designed to improve collaborative understanding, communication, and role clarification among students from different healthcare disciplines. The learning activities included case-based discussions, collaborative group work, and interactive dialogue. These strategies were used to support shared learning, mutual respect, interdisciplinary awareness, and teamwork orientation, in line with previous studies on interactive IPE models (Ferreira et al., 2023; Langlois & Goudreau, 2024; Martin et al., 2021). Students' attitudes toward interprofessional collaboration and interprofessional competence were measured using validated self-administered questionnaires. Because the Kolmogorov-Smirnov test with Lilliefors correction showed that the data were not normally distributed, the Wilcoxon signed-rank test was used to compare pretest and posttest scores. The level of significance was set at $p < 0.05$. This study was conducted from January to March 2025 and received ethical approval under Ethical Clearance Number 015/I/EC/P3M/STIKES/2025.

RESULTS AND DISCUSSION

A total of 110 students participated in this study. Descriptive analysis showed an increase in students' attitudes toward interprofessional collaboration after the IPE intervention. The mean attitude score increased from 77.64 before the intervention (range: 70–90) to 80.50 after the intervention (range: 75–90). The post-intervention scores also showed a narrower range, indicating more consistent attitudes among students after participating in IPE. Figure 1 shows an upward shift in the median attitude score after the intervention. The narrower interquartile range suggests a more consistent positive response among students. Although several outliers were present, the overall distribution supports the significant improvement in attitude found in the Wilcoxon signed-rank test ($Z = -4.821$; $p < 0.05$).

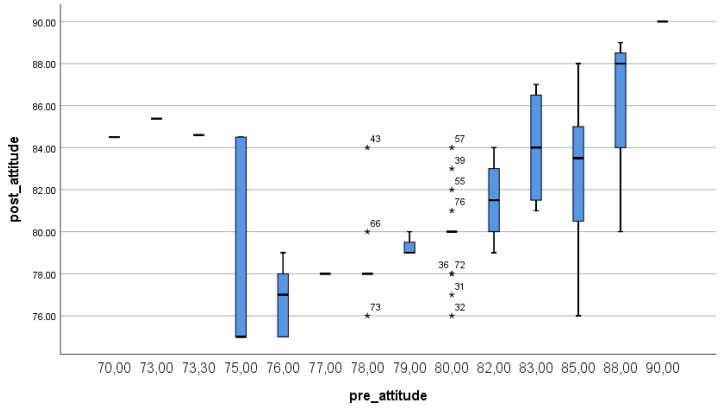

Figure 1. Boxplot of Attitude Scores Before and After IPE

The boxplot of competence scores shows only a slight increase in the median score from pretest to posttest. The large overlap between distributions and the variability among students indicate that the IPE intervention did not produce a consistent improvement in competence. This visual pattern is consistent with the non-significant Wilcoxon signed-rank test result (Z = −0.838; p > 0.05).

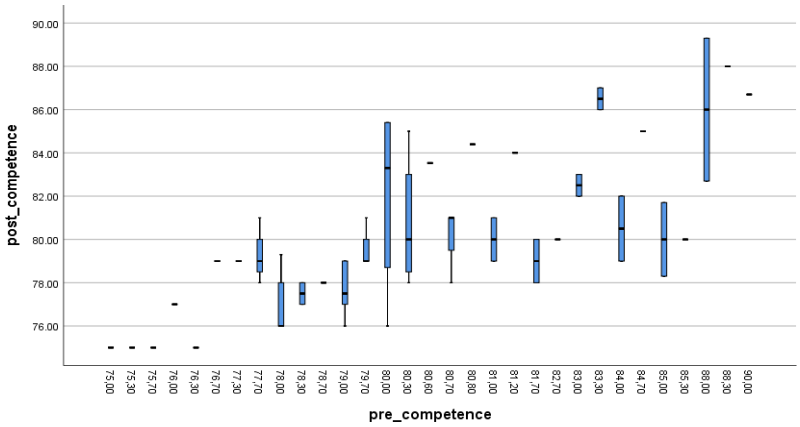

Figure 2. Boxplot of Competence Scores Before and After IPE

For interprofessional competence, the mean score increased slightly from 80.24 before the intervention (range: 75–90) to 80.40 after the intervention (range: 75–89.30). Although a small increase was observed, the magnitude of change was minimal. The Kolmogorov-Smirnov test with Lilliefors correction showed that all variables (pre-attitude, post-attitude, pre-competence, and post-competence) were not normally distributed (p < 0.05). Therefore, the Wilcoxon signed-rank test was used to examine the differences between pretest and posttest scores.

Table 1. Summary of Wilcoxon Signed-Rank Test Results

Variable	Z Value	p-value	Interpretation	Effect Direction
Attitude	-4.821	<0.001	Significant	Increased
Competence	-0.838	0.402	Not significant	Slight increase

The Wilcoxon signed-rank test showed a statistically significant difference in students' attitudes before and after the IPE intervention (Z = −4.821; p < 0.001). This result indicates that IPE significantly improved students' attitudes toward interprofessional collaboration. In contrast, the change in competence scores was not statistically significant (Z = −0.838; p = 0.402). Although competence increased slightly in the descriptive analysis, the change was not statistically meaningful.

This study found that Interprofessional Education (IPE) significantly improved students' attitudes toward interprofessional collaboration. However, it did not produce a statistically significant improvement in interprofessional competence during the intervention period. This result suggests that IPE is more effective in influencing the affective domain of learning in the short term. Attitudes toward teamwork, collaboration, and mutual professional respect can be shaped through structured discussions, shared learning activities, and reflection. These findings are consistent with previous studies showing that attitudinal change may precede competence development in short-term educational interventions.

The absence of significant improvement in competence may be explained by the short duration of the intervention and the limited direct clinical exposure. Interprofessional competence involves communication, shared decision-making, conflict management, and collaborative problem-solving. These skills usually require repeated practice in realistic clinical situations. Therefore, competence

may not develop fully through a short classroom-based intervention. The variability in competence scores may also reflect differences in students' previous collaborative experience, learning adaptation, and the sensitivity of the assessment instrument. Scientifically, this study contributes evidence that IPE can strengthen positive collaborative attitudes, but measurable competence may require more intensive and sustained curricular integration. This distinction between affective and competence-based outcomes is important for curriculum developers and policymakers seeking to improve IPE implementation in health professions education.

Although knowledge was not the main outcome measured in this study, the findings are consistent with previous evidence that IPE can strengthen students' understanding of collaborative practice. Prior studies suggest that IPE is useful for improving students' cognitive understanding of professional roles, teamwork, and healthcare systems. IPE allows students from nursing, medicine, pharmacy, and other health disciplines to learn together and develop a broader understanding of patient care (Fusco et al., 2021; Makino et al., 2022; Nadarajah et al., 2021). Through shared learning, students can see how each profession contributes to healthcare, thereby improving their understanding of interdisciplinary collaboration (Ferreira et al., 2023; Langlois & Goudreau, 2024; Martin et al., 2021). Previous studies have reported that students who participate in IPE show better knowledge than those who learn only within their own discipline (Piper-Vallillo et al., 2023; Zheng et al., 2023). Shared learning can also reduce misconceptions about professional roles and strengthen role clarity in collaborative practice (Gellis et al., 2019; Langlois & Goudreau, 2024; Martin et al., 2021).

Competency-based curricula that include simulation, case-based learning, and clinical practice may further improve students' knowledge and critical thinking (Makeen et al., 2023; Svensberg et al., 2021; Uslu-Sahan & Terzioglu, 2020). Many IPE evaluations use cognitive-oriented assessments, which may explain why knowledge improvement is often easier to detect than changes in attitudes or behavior (Kangas et al., 2023; Lunde et al., 2021; Vyas et al., 2023). IPE has also been reported to support shared decision-making and holistic patient management (André et al., 2023; Keshmiri et al., 2020; Sultan et al., 2022).

The non-significant improvement in competence may also be related to students' readiness for interprofessional learning. Limited interactivity and insufficient hands-on clinical exposure may reduce students' ability to internalize collaborative practice (Aye et al., 2020; Yasin et al., 2023; Yune et al., 2020). When IPE is delivered primarily through lectures or brief discussions, without simulation or clinical immersion, students may understand the concept but still struggle to apply collaborative skills in practice (Langlois & Goudreau, 2024; Phanudulkitti et al., 2023; Yasin et al., 2023). Passive participation can limit role clarification and confidence in teamwork (Morrell et al., 2021; Nakamura et al., 2020; Park & Park, 2021).

Many IPE programs remain academically oriented and are not fully integrated into clinical settings (Faizin, 2023; Saragih et al., 2024). Without real-world interprofessional exposure, students may not feel prepared to manage complex collaborative practice (Salberg et al., 2022; Shida & Otsuka, 2022). Students with limited interdisciplinary experience may experience difficulties in communication and coordination (Ahmad et al., 2023; Miselis et al., 2022). Structured clinical immersion can improve collaborative readiness and communication competence (Causapin et al., 2022; Gellis et al., 2019; Miselis et al., 2022). Institutional culture is also important because discipline-based curricula may reinforce professional silos and limit students' exposure to teamwork across professions (Saragih et al., 2024).

Both intrinsic and extrinsic factors may influence students' attitudes toward IPE. Intrinsic factors include students' previous perceptions of interprofessional collaboration (Makeen et al., 2023; Makino et al., 2022; Park & Park, 2021). If students already have positive attitudes before the

intervention, measurable improvement may be smaller. Extrinsic factors, such as teaching quality, mentorship, and the level of interactive engagement, may also shape attitudinal development (Park & Park, 2021; Vyas et al., 2023; Yu et al., 2020). Negative stereotypes and hierarchical views of professions can limit attitudinal change (Berger-Estilita et al., 2020; Causapin et al., 2022; Miselis et al., 2022). Short-term interventions without immersive collaboration may not be enough to challenge established professional bias (Gellis et al., 2019; Miselis et al., 2022; Shida & Otsuka, 2022). Longer, repeated exposure may be needed to create stronger, more meaningful changes in attitudes (Makeen et al., 2023; Rosasco et al., 2021; Yu et al., 2020). Consistent with the quantitative findings, improvement in interprofessional competence was not statistically significant. Competence development requires more than theoretical exposure; it requires practical engagement in communication, negotiation, and shared decision-making (Kangas et al., 2023; Yune et al., 2020).

Without structured clinical immersion, students may have difficulty internalizing collaborative behaviors (Saragih et al., 2024; Swinnen et al., 2021). Limited duration and fragmented implementation may reduce opportunities for skill consolidation (Allvin et al., 2020; Straub et al., 2020). Communication barriers, differences in professional language, and hierarchical perceptions may further limit competence development (Heath et al., 2019; la Rosa-Salas et al., 2020; Vatn & Dahl, 2022). Previous studies emphasize that interprofessional competence requires experiential learning environments that reflect real clinical teamwork (Haber et al., 2021; Heath et al., 2019; Oh et al., 2020). Shared decision-making also involves complex interactional skills that cannot be fully developed through classroom instruction alone (André et al., 2023; Miselis et al., 2022; Phanudulkitti et al., 2023). Therefore, longitudinal and practice-integrated models are needed to achieve measurable competence gains.

Several contextual factors may have influenced the findings of this study. Learning methods, program duration, and the educational environment can determine IPE effectiveness (Lunde et al., 2021; Yu et al., 2020). Short-term interventions may improve cognitive awareness but may be less effective in changing behavioral competence (Lestari et al., 2023; McNulty & Politis, 2023; Uslu-Sahan & Terzioglu, 2020). Integrating IPE into authentic clinical environments can strengthen collaborative skill development (Al Nufaiei & Zipp, 2022; Hughes & Rushton, 2022). To optimize outcomes, IPE programs should combine theoretical learning with structured clinical immersion (Al Nufaiei & Zipp, 2022; Saragih et al., 2024; Yu et al., 2020), use interactive strategies such as simulation and team-based cases (Ahmad et al., 2023; Cheng et al., 2020; Fleming et al., 2023), and apply competency-based assessment systems (Forero et al., 2020; Lunde et al., 2021; McNulty & Politis, 2023). These findings suggest that health education institutions should redesign IPE programs so that improvements in attitudes can be translated into measurable interprofessional competence.

CONCLUSION

This study demonstrates that Interprofessional Education (IPE) improves students' attitudes toward interprofessional collaboration. However, it does not significantly improve interprofessional competence within a short intervention period. These findings indicate that IPE can positively influence the affective domain, but competence development requires a longer duration, repeated exposure, and integration into clinical practice. Future IPE programs should therefore use longitudinal, practice-based, and competency-oriented approaches to support the sustainable development of interprofessional skills among healthcare students.

DECLARATION OF GENERATIVE AI

The authors declare that no generative AI or AI-assisted technologies were used in the writing process of this manuscript.

CONFLICTING INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

FUNDING INFORMATION STATEMENT

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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