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Effectiveness of an Interprofessional Education Module among Health Professions Students: A Pre–Post Evaluation Study

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ABSTRACT

The World Health Organization recommends the implementation of interprofessional healthcare teams to address the increasing complexity of patient populations. Interprofessional Education (IPE) is recognised as a key educational strategy for preparing healthcare professionals to work effectively in such teams, as it is fundamental to the development of collaborative practice and fosters opportunities for mutual understanding, constructive dialogue, and cooperation, with the ultimate aim of delivering high-quality and safe care. This study presents a pre–post evaluation of an IPE course that included an interprofessional collaborative learning unit attended by undergraduate students in Nursing, Occupational Therapy, and Physiotherapy, as well as postgraduate students in Medicine. The impact of the educational intervention was assessed in both the short and long term using the Interprofessional Attitudes Scale (IPAS), which measures attitudes related to the Core Competencies for Interprofessional Collaborative Practice. Data analysis focused on changes across the five IPAS subscales. At post-intervention, the Interprofessional Biases subscale showed the lowest level of agreement (54%). Strong agreement was observed for Teamwork, Roles and Responsibilities (≥75%) and Community-Centredness (≥79%), while extremely high agreement was reported for Diversity and Ethics (94%) and Patient-Centeredness (97%). The IPE intervention demonstrated a positive short-term effect on students' attitudes towards interprofessional collaboration, particularly in relation to teamwork, professional roles, and the reduction of interprofessional biases. However, these effects were not sustained in the long term. Overall, the findings support existing literature by confirming the short-term impact of

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IPE on students' attitudes, perceptions, understanding of professional roles, and recognition of the value of other health professions.

Keywords: Interprofessional Education; Interdisciplinary Communication; Program Evaluation

1. Introduction

The contemporary patient population is characterised by increasing complexity due to multiple comorbidities and the multidimensional nature of health problems, which require an interprofessional collaborative approach. To address this complexity, the World Health Organization (WHO) advocates the adoption of collaborative models in healthcare, beginning with the establishment of interprofessional healthcare teams that actively involve patients, families, and communities. These teams are expected to work collaboratively to deliver high-quality care. Evidence shows that Interprofessional Collaborative Practice (IPC), supported by Interprofessional Education (IPE), can improve health outcomes and patient safety, enhance responsiveness to epidemics, and reduce mortality rates and healthcare costs [1–4].

Specific educational approaches are therefore required to prepare healthcare professionals to work effectively in interprofessional teams. In this context, IPE represents a didactic strategy that promotes critical thinking and prepares students to operate in healthcare settings where teamwork is essential [5–7]. IPE is considered fundamental for fostering collaborative practice through interdisciplinary educational pathways that encourage shared learning, constructive exchange, and cooperation, with the ultimate aim of delivering safe and high-quality care [4–8]. Consequently, IPE has been identified as a key component in the redesign of healthcare systems to improve care quality and health outcomes [5–8].

Over the past decade, a growing body of evidence has demonstrated the positive effects of IPE on learners' knowledge, skills, attitudes, and behaviours [6–8]. As a result, many universities have increasingly implemented IPE activities involving interprofessional student groups, as these initiatives require the integration of a broader range of competencies than mono-professional education [3–8]. A systematic review [2] highlighted the impact of IPE on health professions students, reporting improvements in attitudes and perceptions, increased understanding of professional roles, enhanced collaborative skills, and perceived or actual behavioural changes. IPE has been shown to improve attitudes towards other disciplines, promote recognition of mutual value, and strengthen collaborative skills by fostering shared responsibility for health outcomes [2]. Moreover, it supports students' understanding of professional roles and enhances teamwork, communication, and interprofessional collaboration [9].

Despite its recognised effectiveness, the planning and implementation of IPE remain complex. Factors such as faculty engagement, programme design, institutional support, and implementation strategies significantly influence educational outcomes [6]. Integrating meaningful interprofessional learning experiences into curricula requires overcoming several barriers and challenges [9]. Among these, the literature identifies limited understanding of professional roles and insufficient mutual respect as major obstacles to effective interprofessional collaboration [10]. Negative stereotypes can hinder teamwork; however, early exposure to IPE during university education has been shown to mitigate these biases, improve teamwork skills, and promote perceptions of professional equality [11].

To address these challenges, the literature recommends involving multiple stakeholders from the planning phase, organising student cohorts with an appropriate level of autonomy, and integrating virtual technologies into IPE activities [9]. Suggested educational strategies include curriculum reform [10], interprofessional ethics activities, high-fidelity simulations [12–15], clinical and community-based learning experiences, interdisciplinary theoretical courses, and structured reflection activities for both teams and individuals [12–16]. Given the importance of practice-based interprofessional education and the initial lack of well-defined theoretical frameworks, interprofessional researchers and educators have developed guidelines to support the planning, implementation, and evaluation of IPE initiatives [1, 6, 14, 17].

The SUPSI (University of Applied Sciences and Arts of Southern Switzerland) & USI (University of Italian Switzerland) Project

Since 2019, the University of Applied Sciences and Arts of Southern Switzerland (SUPSI) and the University of Italian Switzerland (USI) have collaborated on *Interpro* (Interprofessional Collaboration: an Overview in the Health System), an educational programme based on the IPE approach. The course is grounded in a competence-based framework, adult learning principles, training intentionality, and a flexible learning environment. Its primary objective is to promote awareness of the importance of IPE as a prerequisite for effective interprofessional collaboration (IPC), as well as to highlight the impact of IPC on quality of care, health outcomes, organisational climate, and professionals' satisfaction[18].

Additional learning outcomes include: (1) acquiring core concepts for interprofessional collaborative practice; (2) grounding IPC in current international recommendations; (3) directly experiencing the challenges and added value of IPC-based practice; (4) addressing professional, ethical, organisational, and clinical issues from multiple professional perspectives; and (5) developing awareness of, respect for, and collaboration across professional roles and competencies. As most medical students are German-speaking, the module is delivered in English, also supporting the development of professional language skills.

The module is planned, delivered, and evaluated by an interdisciplinary teaching team representing the four participating degree programmes, in line with literature recommendations[19]. The course includes an interprofessional collaboration learning unit open to undergraduate students in Nursing, Occupational Therapy, and Physiotherapy, as well as postgraduate students in Medicine. The programme consists of twelve teaching units delivered over four days. Following individual preparatory work using materials uploaded on a dedicated Moodle platform, students participate in small-group discussions of clinical cases involving acute and chronic conditions and ethical dilemmas. The course concludes with a plenary feedback session in which both students and lecturers evaluate the learning experience.

This study aimed to evaluate the short-term and long-term impact of the Interpro course on students' attitudes and readiness for interprofessional collaboration, addressing the limited evidence on the sustainability of IPE outcomes over time. Specifically, the objectives were to assess: (1) baseline interprofessional attitudes prior to the course; (2) changes in attitudes in the short term (1–2 months) and long term (6–7 months) following course completion; and (3) differences according to gender and field of study (Nursing, Physiotherapy, Occupational Therapy, and Medicine).

2. Materials and Methods

The session is described following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Checklist for cohort studies[20].

2.1. Study Design

We chose to implement an observational pre-post study. This design, without a control group, was chosen instead of a case-control or randomized design to be able to include all students in the teaching programme and for logistical reasons (the project was conducted during the pandemic period).

2.2. Setting

The study took place on the shared campus of SUPSI and USI. Data were collected in three waves via a web survey using Qualtrics software. For baseline data collection, the complete questionnaire was sent to all the students at the beginning of the educational intervention. For data collection at follow-up 1 (between 1 and 2 months from the end of the course) and follow-up 2 (between 6 and 7 months from the end of the course), a reduced version of the questionnaire (containing only the 27 items of the IPAS scale) was sent to the students who participated in the baseline data collection.

2.3. Participants

The participants in the course were:

1) USI students at the beginning of their Master's studies who obtained their bachelor's degree at the universities of Basel, Zurich, and Eidgenössische Technische Hochschule or ETH Zurich (Swiss Federal Institute of Technology in Zurich). The contents and prerequisites for IPE and IPC are only known for ETH, where the subject of IPC is dealt with. In the first semester,

ETH students experience IPC from the point of view of teamwork while being team members in emergency cases, while in the fifth and sixth semesters, the interprofessional programs are not yet known.

2) SUPSI-DEASS (Department of Business Economics, Health and Social Care, University of Applied Sciences and Arts of Southern Switzerland) students in nursing, physiotherapy, and occupational therapy, all at the beginning of the third year of bachelor training, with internships and clinical experience in various care facilities. Since the 1st year, common training parts on the IPC topic have been experienced, as well as some particularities of IPE.

2.4. Variables and Data Sources

The main analyzed variable was the students' interprofessional attitudes, which were considered in the pre-didactic intervention, the post-short, and the post-long term.

Several specific tools have been considered to evaluate the course's impact, and the Interprofessional Attitudes Scale (IPAS) has been chosen [21]. The scale was designed to assess the attitudes related to the 2011 Core Competencies for Interprofessional Collaborative Practice. IPAS consists of a 27-item tool measuring the degree of agreement (on a 5-point Likert scale, from 1 "Strongly disagree" to 5 "Strongly agree") with statements regarding 5 subscales, namely "Teamwork, Roles, and Responsibilities" (9 statements), "Patient-Centeredness" (5 statements), "Interprofessional Biases" (3 statements), "Diversity & Ethics" (4 statements), and "Community-Centeredness" (6 statements).

Students' characteristics, namely gender, age, field of study (nursing, physiotherapy, occupational therapy, medicine), and previous experiences in the healthcare sector (measured in months), have also been collected.

2.5. Bias

Possible impact factors (field and previous clinical experience) have been collected and analyzed with the data to manage the biases.

Considering the small number of students enrolled in occupational therapy and physiotherapy courses compared to medicine and nursing, they were grouped for the analysis of some items. Upon evaluating these indicators and the characteristics of the two student populations, no biases were found that could alter the overall interpretation.

The decision to reduce the questionnaire used in the long term was carefully evaluated: it was considered that the small number of items eliminated would not impact the overall assessment of learning, while it would reduce the time needed to complete the questionnaire, with the possibility of increasing overall participation/responsiveness.

The study design chosen lacked a control group and did not allow causal conclusions; however, it still allowed for a robust assessment of the correlation between the intervention and the outcome while accounting for individual heterogeneity (every student acts as its own control).

2.6. Study Size

The convenience samples involved all the students participating in the didactic module.

2.7. Statistical Methods

Descriptive statistics were used to present the characteristics of the students who participated in the survey. The representativeness of the respondents according to the field of study and the baseline distributions of the IPAS items were assessed through a graphical analysis.

Subscale overall scores were calculated as the mean of each subscale's items, first reversing the score of the 8th item of the subscale "Teamwork, roles and responsibilities" (the only one "against" interprofessional behaviour). Anticipating the widespread non-normality characterizing the scores' distributions, baseline differences in the 5 IPAS subscale scores according to gender and field of study were assessed using the Mann-Whitney or Kruskal-Wallis tests, respectively. Overall, gender-specific and field of study-specific variations between baseline and follow-ups 1 and 2 were assessed using the Wilcoxon signed-rank test. Effect sizes were calculated to assess the magnitude of the statistically significant differences. For the Mann-Whitney and Wilcoxon signed-rank test, the effect size *r* was calculated using the following formula $r = \frac{|z|}{\sqrt{n}}$, where *z* is the test statistic and *n* is the total number of observations. For the Wilcoxon signed-rank test, *n* represents the total number of observations over the two time points (i.e., twice the number of cases). The indicator ranges from 0 to 1; an r-value between 0 and 0.09

indicates a negligible effect; between 0.10 and 0.23 a small effect; between 0.24 and 0.36 a medium effect; between 0.37 and 0.70 a large effect and an r-value greater than 0.70 indicates a very large effect. For the Kruskal-Wallis test, the effect size η^2 was calculated using the following formula $\eta^2 = \frac{H - k + 1}{n - k}$, where H is the χ^2 Kruskal-Wallis statistic, k is the number of groups and n is the total number of observations. This indicator also ranges from 0 to 1. The value of η^2 indicates the percentage of the variance in the IPAS subscales accounted for by the independent variable. A η^2 value below 0.06 indicates a small effect, between 0.06 and 0.13 a moderate effect, and a value equal to or greater than 0.14 a large effect.

Statistical significance threshold was set to 5%. All analyses were conducted using Stata/IC 16.0 (StataCorp, 4905 Lakeway Drive, College Station, Texas, USA).

2.8. Ethical Approval

In Switzerland, this kind of study does not require submission to the Ethical Committee [22]. Data have been collected and analyzed anonymously; informed consent was obtained from every participant.

3. Results

The total number of students that participated in the educational intervention was 169: 46 medicine students, 80 nursing students, 26 physiotherapy students, and 17 occupational therapy students. The baseline questionnaire was first distributed on September 16th, 2020; a recall was sent on September 24th, 2020, and data collection ended on October 1st, 2020. Baseline data were obtained for 139 students (82.2% response rate); however, complete questionnaires were available for 136 students only (80.5% complete response rate).

The second wave of data collection (follow-up 1) started on October 21st, 2020, distributing the reduced version of the questionnaire to the 139 students assessed at baseline. A first recall was sent on November 4th, 2020, and a second recall was sent on November 16th, 2020; follow-up 1 data collection ended on November 26th, 2020. Follow-up 1 data were obtained for 67 of the 139 students who completed baseline assessment (48.2% response rate), but complete questionnaires were available for 65 students only (46.8% complete response rate).

The third wave of data collection (follow-up 2) started on March 17th, 2021, distributing the reduced version of the questionnaire to the 139 students assessed at baseline. A recall was sent on April 12th, 2021, and follow-up 2 data collection ended on April 15th, 2021. In follow-up 2, data were obtained for 83 of the 139 students who completed the baseline assessment (59.7% response rate), but complete questionnaires were available for 77 students only (55.4% complete response rate).

Considering the small number of students enrolled in occupational therapy and physiotherapy courses, compared to other disciplines, in some data analysis, they have been considered together.

The students who underwent baseline assessment were mainly women (68.4%), aged between 21 and 24 (74.8%).

The most common fields of study were nursing and medicine (46% and 30.2%, respectively); respondents were well-representative of all students in the four fields of study considered. Around 3/4 of the respondents have had previous experience in the healthcare sector (77%), mainly lasting less than 1 year (63.8%) (**Figure 1**).

Most of the respondents (77%) have had previous experiences in the healthcare sector, mainly (63.8%) lasting less than 1 year.

Considering the significant attrition rates characterizing follow-ups 1 and 2 (around 50%), the following results should be interpreted with caution because of potential self-selection problems and reduced statistical power.

3.1. Baseline Assessment

We found a strong level of agreement with all statements of the subscales “Teamwork, Roles, and Responsibilities” (at least 75% of respondents “Agree” or “Strongly Agree” with all statements, with the exception of one statement “against” interprofessional behavior for which we found 78% of students that “Disagree” or “Strongly disagree”), “Patients-Centeredness” (at least 83% of students “Agree” or “Strongly Agree” with all statements), “Diversity & ethics” (at least 94% of students “Agree” or “Strongly Agree” with all statements) and “Community-centeredness” (at least 79% of students “Agree” or “Strongly Agree” with all statements). We found instead lower levels of agreement or strong agreement with the three items of the “Interpro-

fessional biases" subscale, ranging from 30% to 60% (see **Supplementary Materials** for a detailed description of the subscales' items and a graphical representation of the responses' distribution).

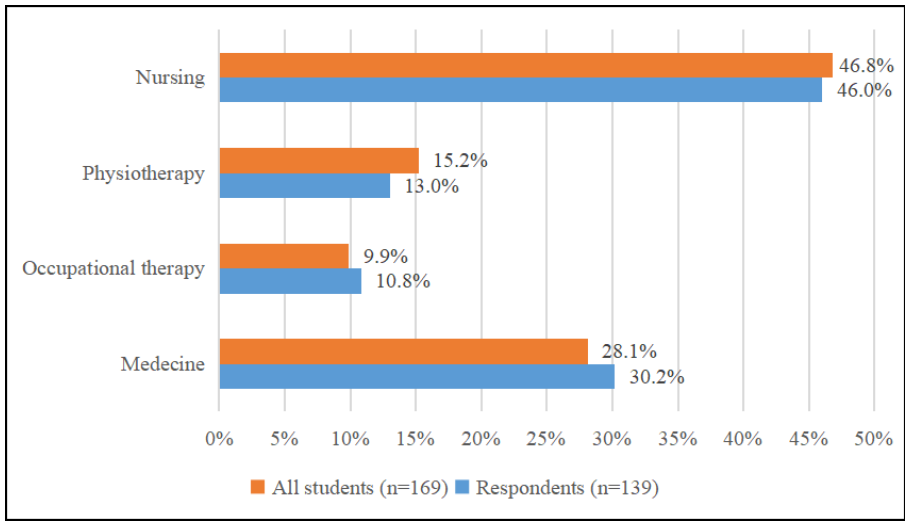


Figure 1. Representativeness of the respondents at baseline according to the field of study.

Baseline differences in the 5 IPAS subscale scores by gender and field of study of the students who completed the follow-up 1 and/or 2 questionnaire are presented in **Table 1**. We found significant baseline differences in the "Interprofessional biases" subscale according to the field of study; the average level of agreement was lower for nursing students. Among students who completed the follow-up 1 questionnaire, we found significant baseline differences in the "Patient-centeredness" subscale by field of study (physiotherapy and occupational therapy students reported a slightly lower average level of agreement), which was not confirmed in the sample of students who completed the follow-up 2 questionnaire. However, on the one hand, the *p*-value of the Kruskal-Wallis test was just above 5% ($\chi^2(2) = 5.80$; *p*-value = 0.055), while on the other hand, we considered relatively small variations over very high average levels of agreement. Similar considerations yielded for the "Diversity & ethics" subscale, with the *p*-value of the Kruskal-Wallis test just above 5% ($\chi^2(2) = 5.99$; *p*-value = 0.0501) in the sample of students that completed the follow-up 2 questionnaire. Finally, in the sample of students that completed the follow-up 2 questionnaire, we also found significant baseline differences in the "Teamwork, roles and responsibilities" subscale according to the field of study (medicine students reported a higher average level of agreement), which is not confirmed in the other sample of students.

Table 1. IPAS subscales baseline levels and differences according to gender and field of study.

IPAS Subscales	Gender			Field of Study			
	Women	Men	Mann-Whitney Test Result (Effect Size)	Nursing	Medicine	Physiotherapy, Occupational Therapy	Kruskal-Wallis Test Result (Effect Size)
FU 1 Students[1]							
Teamwork, roles and resp.	4.11 (0.66)	4.22 (0.70)	$z = 0.89$ (-)	4.22 (0.67)	4.44 (0.89)	4.06 (0.72)	$\chi^2(2) = 0.91$ (-)
Patient-centeredness	4.80 (0.60)	4.60 (0.40)	$z = 0.48$ (-)	4.80 (0.50)	4.80 (0.45)	4.50 (0.75)	$\chi^2(2) = 10.53$** ($\eta^2 = 0.14$)
Interprofessional biases	3.00 (1.00)	3.67 (1.33)	$z = -0.96$ (-)	2.67 (1.00)	3.67 (1.08)	3.67 (1.00)	$\chi^2(2) = 14.78$*** ($\eta^2 = 0.20$)
Diversity & ethics	4.50 (0.75)	5.00 (0.75)	$z = -1.01$ (-)	4.75 (0.69)	5.00 (0.50)	4.50 (1.00)	$\chi^2(2) = 5.99$ (-)
Community-centeredness	4.00 (0.67)	4.17 (0.33)	$z = -1.46$ (-)	4.00 (0.42)	4.25 (0.66)	4.08 (0.33)	$\chi^2(2) = 0.22$ (-)
FU 2 Students[2]							
Teamwork, roles and resp.	4.11 (0.67)	4.22 (0.67)	$z = -0.05$ (-)	4.11 (0.63)	4.55 (0.67)	4.00 (0.56)	$\chi^2(2) = 6.96$* ($\eta^2 = 0.06$)
Patient-centeredness	4.80 (0.35)	4.60 (0.60)	$z = 1.35$ (-)	4.70 (0.60)	4.80 (0.40)	4.60 (0.80)	$\chi^2(2) = 5.80$ (-)
Interprofessional biases	3.17 (1.00)	3.33 (1.00)	$z = -1.30$ (-)	3.00 (1.34)	3.67 (0.67)	3.67 (0.67)	$\chi^2(2) = 9.43$** ($\eta^2 = 0.10$)
Diversity & ethics	4.50 (0.75)	4.88 (0.75)	$z = -1.26$ (-)	4.75 (0.75)	5.00 (0.50)	4.50 (0.75)	$\chi^2(2) = 7.57$* ($\eta^2 = 0.07$)
Community-centeredness	4.17 (0.67)	4.17 (0.67)	$z = -0.85$ (-)	4.08 (0.71)	4.00 (1.09)	4.17 (0.33)	$\chi^2(2) = 0.68$ (-)

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. [1]: Students who participated in the baseline and follow-up 1 assessments. [2]: Students who participated in the baseline and follow-up 2 assessments.

3.2. Variations between Baseline Assessment, Follow-Up 1 and Follow-Up 2

Table 2 shows the IPAS subscales levels at baseline and follow-up 1 in general and according to gender and field of study, together with the statistical testing of the differences between the two assessments considered. **Table 3** reports the same content as **Table 2** but considers the second follow-up questionnaire instead of the first. Both tables indicate that at baseline and follow-ups 1 and 2, there was a very high average level of agreement, especially in the subscales of "Patient-centeredness" and "Diversity & ethics", but also in the subscales of "Teamwork, roles and responsibilities" and "Community-centeredness". Instead, the average level of agreement was much lower in the subscale of "Interprofessional biases".

Table 2 shows that the educational intervention had a short-term effect (1/2 months from the end of the course) mainly on the "Teamwork, roles, and responsibilities" subscale, with a significant increase in the average level of agreement in general, for nursing and physiotherapy/occupational therapy students and women. Moreover, a strong short-term positive effect was remarked in the "Interprofessional biases" subscale for nursing students, while we noticed the opposite in the "Diversity & ethics" subscale for medicine students. We finally remarked a small positive general short-term effect on the "Community-centeredness" subscale. However, **Table 3** indicates that the educational intervention had no significant long-term effect (6/7 months from the end of the course) on any of the 5 subscales considered.

Table 2. IPAS subscales levels and variations between baseline and follow-up 1 in general and according to gender and field of study.

IPAS Subscales	Subgroups	Median (Interquartile Range)		Wilcoxon Signed-Rank Test of the Differences between Baseline and Follow-Up 1	
		Baseline	Follow-Up 1	Test Result	Effect Size
Teamwork, roles and responsibilities	Total (n = 65)	4.11 (0.67)	4.33 (0.72)	z = 2.96**	r = 0.26
	Nursing (n = 23)	4.22 (0.67)	4.44 (0.78)	z = 2.66**	r = 0.39
	Medicine (n = 18)	4.44 (0.89)	4.32 (0.86)	z = −0.04	-
	Phy/occ. (n = 24)	4.06 (0.72)	4.28 (0.64)	z = 2.23*	r = 0.32
	Women (n = 43)	4.11 (0.66)	4.33 (0.78)	z = 2.81**	r = 0.30
	Men (n = 22)	4.22 (0.70)	4.33 (0.75)	z = 1.17	-
Patient-centeredness	Total (n = 66)	4.70 (0.40)	4.80 (0.60)	z = 0.76	-
	Nursing (n = 24)	4.80 (0.50)	4.80 (0.55)	z = 0.25	-
	Medicine (n = 18)	4.80 (0.45)	4.90 (0.70)	z = −0.61	-
	Phy/occ. (n = 24)	4.50 (0.75)	4.50 (0.75)	z = 1.61	-
	Women (n = 43)	4.80 (0.60)	4.80 (0.60)	z = 1.02	-
	Men (n = 23)	4.60 (0.40)	4.60 (0.60)	z = −0.03	-
Interprofessional biases	Total (n = 66)	3.33 (1.33)	3.33 (1.08)	z = 1.22	-
	Nursing (n = 24)	2.67 (1.00)	3.33 (1.00)	z = 3.33***	r = 0.48
	Medicine (n = 18)	3.67 (1.08)	3.50 (1.08)	z = −1.05	-
	Phy/occ. (n = 24)	3.67 (1.00)	3.57 (1.33)	z = −0.87	-
	Women (n = 43)	3.00 (1.00)	3.33 (1.00)	z = 1.29	-
	Men (n = 23)	3.67 (1.33)	3.67 (1.33)	z = 0.18	-
Diversity & ethics	Total (n = 65)	4.75 (0.75)	5.00 (0.75)	z = 0.77	-
	Nursing (n = 24)	4.75 (069)	5.00 (0.50)	z = 1.34	-
	Medicine (n = 18)	5.00 (0.50)	4.75 (1.00)	z = −2.40*	r = 0.40
	Phy/occ. (n = 23)	4.50 (1.00)	4.75 (0.75)	z = 1.89	-
	Women (n = 42)	4.50 (0.75)	5.00 (0.75)	z = 1.67	-
	Men (n = 23)	5.00 (0.75)	4.50 (0.75)	z = −1.14	-
Community-centeredness	Total (n = 64)	4.17 (0.33)	4.33 (0.83)	z = 2.09*	r = 0.18
	Nursing (n = 22)	4.00 (0.42)	4.42 (0.83)	z = 1.42	-
	Medicine (n = 18)	4.25 (0.66)	4.25 (0.70)	z = 0.18	-
	Phy/occ. (n = 24)	4.08 (0.33)	4.25 (0.96)	z = 1.74	-
	Women (n = 41)	4.00 (0.67)	4.17 (0.67)	z = 1.47	-
	Men (n = 23)	4.17 (0.33)	4.33 (0.83)	z = 1.48	-

Note: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Table 3. IPAS subscales levels and variations between baseline and follow-up 2 in general and according to gender and field of study.

IPAS Subscales	Subgroups	Median (Interquartile Range)		Wilcoxon Sign-Ranked Test of the Differences between Baseline and Follow-Up 1
		Baseline	Follow-Up 2	
Teamwork, roles and responsibilities	Total (n = 80)	4.11 (0.67)	4.22 (0.78)	z = 0.20
	Nursing (n = 40)	4.11 (0.63)	4.22 (0.66)	z = 1.29
	Medicine (n = 19)	4.55 (0.67)	4.22 (0.89)	z = −1.39
	Phy/occ. (n = 21)	4.00 (0.56)	4.00 (0.77)	z = 0.23
	Women (n = 52)	4.11 (0.67)	4.22 (0.67)	z = 0.52
	Men (n = 28)	4.22 (0.67)	4.22 (0.78)	z = −0.25
Patient-centeredness	Total (n = 81)	4.60 (0.50)	4.60 (0.80)	z = −0.02
	Nursing (n = 42)	4.70 (0.60)	4.60 (1.00)	z = 0.38
	Medicine (n = 18)	4.80 (0.40)	4.90 (0.45)	z = 0.43
	Phy/occ. (n = 21)	4.60 (0.80)	4.60 (0.80)	z = −0.54
	Women (n = 52)	4.80 (0.35)	4.70 (1.00)	z = −0.45
	Men (n = 29)	4.60 (0.60)	4.60 (0.80)	z = 0.55
Interprofessional biases	Total (n = 81)	3.33 (1.00)	3.33 (1.33)	z = 1.05
	Nursing (n = 43)	3.00 (1.34)	3.00 (1.67)	z = 1.33
	Medicine (n = 17)	3.67 (0.67)	4.00 (1.17)	z = 0.29
	Phy/occ. (n = 21)	3.67 (0.67)	3.33 (0.83)	z = −0.42
	Women (n = 52)	3.17 (1.00)	3.17 (1.00)	z = 0.58
	Men (n = 29)	3.33 (1.00)	4.00 (1.00)	z = 0.94
Diversity & ethics	Total (n = 78)	4.75 (0.75)	4.50 (0.75)	z = −0.39
	Nursing (n = 43)	4.75 (0.75)	4.50 (0.75)	z = −0.08
	Medicine (n = 16)	5.00 (0.50)	4.88 (0.75)	z = −1.06
	Phy/occ. (n = 19)	4.50 (0.75)	4.50 (1.00)	z = 0.33
	Women (n = 52)	4.50 (0.75)	4.50 (0.69)	z = 0.21
	Men (n = 26)	4.88 (0.75)	4.50 (0.75)	z = −1.09
Community-centeredness	Total (n = 78)	4.17 (0.67)	4.00 (0.67)	z = −0.39
	Nursing (n = 42)	4.08 (0.71)	4.00 (0.54)	z = −0.39
	Medicine (n = 17)	4.00 (1.09)	4.00 (0.75)	z = 0.26
	Phy/occ. (n = 19)	4.17 (0.33)	4.00 (0.84)	z = −0.34
	Women (n = 51)	4.17 (0.67)	4.00 (0.67)	z = 0.07
	Men (n = 27)	4.17 (0.67)	4.17 (0.67)	z = −0.85

4. Discussion

The baseline assessment revealed a generally high level of interprofessional attitudes across all subscales, with the exception of "Interprofessional Biases". This latter dimension was particularly evident among nursing students, who reported significantly lower agreement levels compared to medical and physiotherapy/occupational therapy students.

The educational intervention was associated with a positive short-term effect, primarily in the "Teamwork, Roles, and Responsibilities" subscale, especially among nursing and physiotherapy/occupational therapy students and among women.

Improvements were also observed in the "Interprofessional Biases" subscale, although this effect was limited to nursing students. These findings are consistent with previous studies reporting short-term benefits of interprofessional education (IPE) interventions [23, 24]. However, the effect did not appear to be sustained over time. It should be noted that the lower response rate at the first follow-up (48.2% compared to 82.2% at baseline) may have influenced these results and could be partly attributed to the timing of data collection, which coincided with the onset of the second wave of COVID-19 in Southern Switzerland.

At baseline, students already demonstrated a strong perception of the value of shared learning for future team functioning and patient relationships, as reflected in the "Teamwork, Roles, and Responsibilities" items, as well as a high recognition of patient centrality (Patients-Centeredness). "Interprofessional Biases" (prejudice perception) were present but reported at lower levels, particularly in terms of self-perception. Similarly, there was substantial agreement re-

garding respect for diversity and ethical principles (Diversity & Ethics), as well as attention to community involvement and public health issues (Community-Centeredness).

At the first follow-up, modest increases were observed in "Teamwork, Roles, and Responsibilities", despite the already high baseline scores. "Patients-Centeredness" remained stable, with a slight increase in the perceived importance of compassionate communication, as did "Diversity & Ethics". In contrast, "Interprofessional Biases" showed a marked increase in awareness of one's own and others' prejudices. This finding represents a meaningful outcome of the IPE intervention and supports its role in shaping attitudes toward other disciplines [2, 12] and in fostering recognition of mutual value [6]. This interpretation is further supported by increases in "Community-Centeredness" items, particularly those related to awareness of actors and elements beyond the immediate clinical context (e.g., policymakers and legislators).

At the second follow-up, "Teamwork, Roles, and Responsibilities" scores remained largely stable, with a notable increase in the perception that shared learning helps individuals recognize their own professional limitations. This sustained awareness may represent an added long-term value of the intervention. "Interprofessional Biases" continued to show increased awareness of prejudices toward other professions and their perceived impact as barriers to care, whereas "Diversity & Ethics", "Patients-Centeredness", and "Community-Centeredness" remained overall stable.

Although the IPE intervention demonstrated clear short-term effects (within 1–2 months), its impact on students' attitudes, perceptions, understanding of professional roles, and recognition of mutual value—previously documented in the literature [2–7, 12]—was only partially maintained over time. The attenuation of long-term effects may reflect the absence of reinforcement opportunities, limited integration of IPE into longitudinal curricula, and the lack of structured occasions to apply interprofessional competencies in authentic or simulated contexts, as suggested by recent literature. To enhance and sustain the effectiveness of IPE, future educational strategies should focus on strengthening long-term impact [6], for example, through follow-up workshops or refresher sessions that encourage the application of acquired knowledge and skills to simulated or practice-based scenarios.

The baseline assessment showed a very high interprofessional attitude among the students in all subscales, except for the Interprofessional Biases subscale; this was particularly marked among nursing students, who reported a significantly lower average agreement level when compared to medicine and physiotherapy/occupational therapy students.

The educational intervention resulted in a positive short-term effect, mainly on the "Teamwork, Roles and Responsibilities" subscale (especially for nursing and physiotherapy/occupational therapy students and for women), and on the "Interprofessional Biases" subscale for nursing students only. However, the effect of educational intervention did not seem to hold in the long term, as reported by previous studies [23, 24]. In this regard, the lower response rate characterizing follow-up 1 data collection (48.2% versus 82.2% at baseline assessment) may be related to the questionnaire's administration period (just after the beginning of the COVID-19 second wave in Southern Switzerland).

At the baseline data collection, there's already a good perception of the shared learning in increasing both future team building and patient relationships (Teamwork, Roles, and Responsibility items), as well as the consideration of patient centrality as fundamental (Patients-Centeredness). Prejudice perception (Interprofessional Biases) is also present, but at a lower level, and it is minor in self-perception.

Respect for others and differences (Diversity & Ethics) has a solid agreement, as well as the community's attention and involvement in public health (Community-Centeredness).

At the first follow-up, although they had a good baseline level, "Teamwork, Roles, and Responsibility" items slightly rose. Items "Patients-Centeredness" remains stable, with a slight increase in the importance of compassionate communication with the patient, as well as "Diversity & Ethics". "Interprofessional Biases" grew substantially in the awareness of one's own and others' prejudices. This seems to be a significant outcome that confirms the IPE impact on attitudes toward other disciplines [2, 12] and in the recognition of mutual value [6]. This last element is confirmed by items of "Community-Centeredness" that increased, especially those regarding the involvement of attention to actors/elements outside the specific clinical context (e.g., legislators/policies).

At the second follow-up, "Teamwork, Roles, and Responsibility" items show an item's stability, with an incre-

ment in the perception that shared learning helps one's own limitations; this data could be considered as an added value because it remains, and it increases in awareness, in the long term.

"Interprofessional Biases" show a substantial increase in the awareness of one's prejudice toward other professions and in the perception of it as an obstacle to care, while "Diversity & Ethics", "Patients-Centeredness", and "Community-Centeredness" perception show an overall stability. Expand slightly on possible reasons why long-term effects were not maintained, linking to recent literature.

Even if the IPE shows a short-term effect (1/2 month), its impact on students' attitudes, perceptions, health roles knowledge, and recognition of mutual value, which emerged in the literature [2, 12], can be confirmed. However, in order to improve the impact of this effectiveness, it is necessary to reflect on how to improve the educational offering [6], particularly by improving its long-term impact. One suggestion could be to organise workshops to review the content after some time has passed, possibly considering strategies for applying the knowledge and skills acquired to simulated cases.

Although there is little literature on this subject, it might be useful to review the curriculum in collaboration with stakeholders. Specifically, the module could be spread over the three years of the course, but above all, a dialogue could be opened with continuing education contexts in order to review and plan the repetition of fundamental elements, modifying teaching strategies over time [6].

5. Limitation

As suggested by the literature [2, 12], a control group could be used in further impact evaluations. In the present study, the pre-post design allows exploring the effect of the educational intervention within subjects, accounting for individual characteristics; however, the lack of a control group and randomization to the treatment hinders both the possibility of conducting a causal analysis and the generalizability of findings. Moreover, two other elements further limit the generalizability of findings and call for a cautious interpretation. On the one hand, the significant attrition rates at the two follow-ups reduce statistical power and may imply self-selection of the respondents, while on the other hand and the strong levels of agreement characterizing many subscales at baseline may imply a ceiling effect that can hinder the observability of changes in the subscales' scores.

From our analysis, we could not determine the best time to introduce IPE, as both pre-clinical and clinical IPE interventions showed some degree of success. It appears that late IPE interventions show a trend to be longer and more statistically significant. It seems reasonable to conclude that interventions should be introduced in the early years and continue throughout the curriculum. More well-designed studies are needed to address this knowledge gap [2, 12].

6. Conclusions

The increasing complexity of healthcare contexts highlights the importance of interprofessional collaboration. IPE represents a recognised strategy for preparing future healthcare professionals to work effectively within interprofessional teams [5, 6, 25].

This study evaluated an IPE programme involving students from Medicine, Nursing, Physiotherapy, and Occupational Therapy to assess its impact on interprofessional attitudes. The educational module demonstrated a positive effect in the short term; however, this effect was not sustained in the long term. These findings suggest that, while IPE interventions can be effective, their impact may be time-limited if not reinforced throughout the educational pathway.

Overall, the results are consistent with existing literature in confirming the short-term effectiveness of IPE and underline the importance of further research on how such interventions can be structured to support the sustainability of their outcomes over time.

Supplementary Materials

The supporting information can be downloaded at https://journals.niepublish.com/public/IPT-415-Supplementary-Materials.docx.

Author Contributions

Conceptualization, M.B., E.S. and A.L.; methodology, M.B., E.S. and A.L.; validation, M.B., E.S., A.L. and C.G.; formal analysis, E.S. and A.L.; investigation, M.B., E.S. and A.L.; resources, M.B.; data curation, M.B., E.S. and A.L.;

writing—original draft preparation, C.G.; writing—review and editing, M.B. and C.G.; visualization, M.B., E.S., A.L. and C.G.; supervision, M.B. and C.G.; project administration, M.B. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

In Switzerland, this kind of study does not require submission to the Ethical Committee (Federal Act on Research Involving Human Beings, 2011).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The research data in anonymous form are available from the authors upon reasonable request.

Conflicts of Interest

The authors declare no conflict of interest.

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