

Article

Transformation from Blended to Online Learning: A Four-Year Longitudinal Cross-Sectional Interprofessional Study

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Abstract: Professional students need to train in online interprofessional collaboration (IPC). During a longitudinal evaluation for 2018–2022 of an interprofessional learning (IPL) curriculum, nearly 7000 students from health, social care, and teacher education programs completed indicator questions concerning learning about child-related topics and skills required for IPC during their first, second, and third curriculum years of study. The students worked in student-led IPL groups according to a case-based learning approach. Online IPL yielded lower mean scores than in-person IPL. The decreased learning outcomes from year 2 to year 3 for the IPL initiative are not due to the online delivery mode. The lack of reported progress in the IPL courses is more likely due to students not experiencing a gain in IPL learning outcomes. Significant differences were found between teacher education and child welfare students and health and social care students, reflecting IPC challenges in working life. We conclude that online IPL is forward-looking because candidates must be prepared for online IPC and for helping users, such as children, online. Although our data support that IPL is complex, the learning experience has tremendous transfer value to welfare services because we assume that the same issues will appear in IPC.

Keywords: online learning; children; interprofessional collaboration; interprofessional learning; spiral curriculum; teacher; nurse; social work; competency-based education; pre-service learning



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1. Introduction

1.1. Online Interprofessional Learning

All professionals within the welfare services, such as health, social, and teacher professionals, need to develop collaborative skills for both in-person and online communications. Interprofessional learning (IPL) occurs “when two or more professionals learn about, from and with each other to enable effective collaboration” [1]. The overall goal of IPL is the successful implementation of interprofessional collaboration (IPC) in welfare services, which ultimately requires improvements in candidates’ communication and collaboration skills [1–4]. In the welfare sector, the use of video consultations or remote health monitoring [5] has expanded during the last decade since it saves the professionals, users, and their next-of-kin time and funds that they would otherwise have spent on traveling and waiting [6,7]. According to the Norwegian government [6], the use of video consultations can also help users feel safer and more in control when meeting with service representatives [6]. Professional students need training in online communication and collaboration in safe online settings [1,2]. Over the last decade and accentuated by the lockdown measures due to the COVID-19 pandemic, studies on online IPL have been encouraging [8–11].

1.2. Review of IPL Literature Targeting Health, Social Care, and Teacher Education in Higher Education

If a child is sick or needs help for some reason, professionals across a range of professional fields, such as health personnel, social workers, and teachers, may become involved [12–26]. However, according to a Norwegian Health Directorate cross-sectoral collaboration survey across eight municipalities in health and social services for vulnerable children and adolescents, teachers expressed that they did not share common ground with the other services [13]. School nurses were frustrated because they were left with the administrative tasks, while the child welfare agency experienced frustration over not being included [13]. This survey from the field of practice reflects a lack of pre-service training and child-related education that may contribute to explaining why professionals who are legally mandated to report various forms of child maltreatment often fail to do so [25,27,28]. The ultimate goal of IPL targeting children, young people, and their families is the systematic development and implementation of evidence-based practices to promote the learning and well-being of such end users [29].

According to Tuominen et al. [29] in their systematic review from 2022, “Interdisciplinary Collaboration Among the Disciplines of Social Care, Health Care and Education in Higher Education”, there is a lack of knowledge regarding education-related interdisciplinary collaboration among health, social care, and teacher education in higher education. They also reported that only two studies [30,31] published on the online delivery mode included learners from health, social care, and teacher education programs; these were further limited by the fact that the arranging parties were from health and social care education programs [29]. Health, social care, and teacher education programs have different jurisdictions, taxonomies, traditions, and core tasks, which may create silo-like divisions of professional responsibilities and influence the delivery of welfare services [32,33]. Tuominen et al. [29] highlight the knowledge gaps concerning various aspects of bringing numerous and heterogeneous professional education programs together in complex IPL, regardless of delivery mode.

1.3. Interprofessional Interaction with Children and Youth (INTERACT)

In 2018, a large-scale IPL initiative (Interprofessional Interaction with Children and Youth [INTERACT]) was launched with the aim of providing students with knowledge of and experience with interprofessional cooperation as well as interprofessional experience [34]. The project extended IPL beyond health and social care by including teacher education and child welfare students because these professions must collaborate in real-life situations around children, young people, and their families [34]. There is a documented gap between the requirements in the legislation and the delivered curriculum regarding both child-related topics and IPL/IPC [16,35,36]; this educational intervention aims to bridge the gap in line with national requirements [37–39].

1.3.1. The Curriculum

Undergraduate students participate in an annual IPL course each year for three consecutive curriculum years and communicate and collaborate in small IPL groups, targeting future IPC among children, young people, and their families as end users [34].

The INTERACT curriculum is structured so that the same topics are repeated throughout the annual IPL courses at increasingly advanced levels [34] and a case-based learning design was applied [40,41]. Case-based learning (CBL) is encouraged in professional education [41] since it may facilitate active learning strategies that promote critical thinking and relational agency through meta-learning [40,42–44]. The definition of CBL suggested by Thistlewaite et al. [41] is as follows: “The goal of CBL is to prepare students for clinical practice, through the use of authentic clinical cases. It links theory to practice, through the application of knowledge to the cases, using inquiry-based learning methods”. The intention of the spiral curriculum is to return to the same topic over several occasions, and each time, the topic should be learned at a deeper and more complex level; thus,

prior knowledge should provide a foundation rather than starting anew [45]. The starting point should be something the learner knows about or can relate to [45]. This curriculum approach aims to break down educational trajectories and cover the overall curriculum; this iterative revisiting of topics is particularly relevant in outcome-based education [45,46]. It has its roots in the constructivist learning framework and Biggs' constructive alignment theory [47]. It aims to enhance student learning as it activates prior knowledge, initiates interest, and reinforces learning [45,46,48–51]. Research evaluation studies mostly revolve around well-defined subjects in uni-professional study programs, such as dental topics [52] or integrating informatics into nursing education [53]. In one interprofessional study among medicine, physiotherapy, nursing, and diagnostic imaging students from Ireland [54], students evaluated IPL small-group learning in a 12-week interprofessional course with other students as a positive experience; furthermore, they regarded the IPL module structure and content as the most important facets. Different student groups' preparedness for IPL in complex IPL may not be equal; thus, in theory, IPL teamwork could enable a low threshold for joint spiral learning on common topics [45,55]. However, Ireland and Mouthan [49] argued that the spiral model has been accepted as a key model for curriculum design, although with limited critical reflection on its suitability across subjects.

1.3.2. Transformation from Face-to-Face IPL Groups to the Online Delivery Mode

Due to the already high but also increasing student volume, the organizers of INTERACT decided to fully digitalize the IPL beginning with the 2020/21 academic year. Thus, a well-planned digital transformation, coincidentally, co-occurred with emergency remote teaching (ERT) of the individual participating study programs due to the pandemic outbreak lockdown measures.

Against this backdrop, we merged two pre-pandemic data sets (2018/19 and 2019/20 academic years) [35,36,56–60] with data sets collected after the pandemic lockdown in March 2020 (2020/21 and 2021/22 academic years) into a four-year repeated cross-sectional study that comprises 7000 professional students. The longitudinal design enables the exploration of results collected during the transformation from a pre-pandemic to a post-pandemic delivery mode.

We have previously published studies from the 2018/19 and 2019/20 academic years based on data from first-year INTERACT students ($n = 2811$) [35,36,56–60]. In particular, first-year health and social care students enhanced their insight into child-related topics after the first-year IPL course, whereas first-year teacher education and child welfare students reported increased insight into vulnerable/at-risk children and the core IPC competencies (roles and responsibilities, values and ethics, interprofessional communication, and teams and teamwork). Presently, the use of the curriculum approach with first-, second-, and third-year students is evaluated based on student responses.

The objective was to compare the students' annual responses, targeting both their individual study programs and the IPL in a longitudinal study design during the 2018–2022 academic years and to explore students' responses to an IPL curriculum over three consecutive curriculum years.

2. Materials and Methods

2.1. Study Design

Data were collected over the 2018–2022 academic years at Oslo Metropolitan University (OsloMet) in Norway. The design is a repeated cross-sectional design over four consecutive years, conducted using an anonymous online questionnaire tool created in Nettskjema [61]. It was not possible to design this study with a control group; instead, we asked the students similar indicator questions about what they had learned in their respective study programs ("pre" the IPL deliveries = questions were targeting the individual study programs) and in the IPL course ("post" the IPL deliveries = the questions were targeting the IPL courses). These indicator questions were assumed to be relevant both regarding the curriculum and the intended learning outcomes on both the respective individual study programs and

the IPL course. The questionnaires were designed to collect responses to these indicator questions and INTERACT, but also responses to questions targeting aspects of educational quality and factors affecting students' learning [62], both before (pre) and after (post) the IPL course deliveries in 2018–22.

To overcome challenges due to the scheduling of the IPL seminars within each study program, all seminars are delivered to the students the first week in January (before the individual study programs started in the spring semester). Thus, the data were collected pre and post an annual IPL course delivered after the Christmas holiday [56].

In the present study, data based on two pre-pandemic studies (delivered via blended learning) are merged with similar data from the 2020/21 and 2021/22 academic years, during which the IPL courses were delivered via well-planned online delivery on Zoom [63,64]. The IPL course in January 2020 was delivered nine weeks ahead of the pandemic lockdown in March, whereas the IPL course in January 2021 was delivered after nearly one year of pandemic lockdown measures, such as social distancing and stay-at-home rules [65,66].

2.2. Students

Undergraduate students from different professional study programs in health, social care, and teacher education were included. Enrollment in the different study programs was gradual, starting with only first-year students. By 2021, the students comprised first-, second-, and third-year students (Figure 1). The only eligibility criterion was being a student who had to take the mandatory IPL course in the curriculum for the academic years 2018–2022.

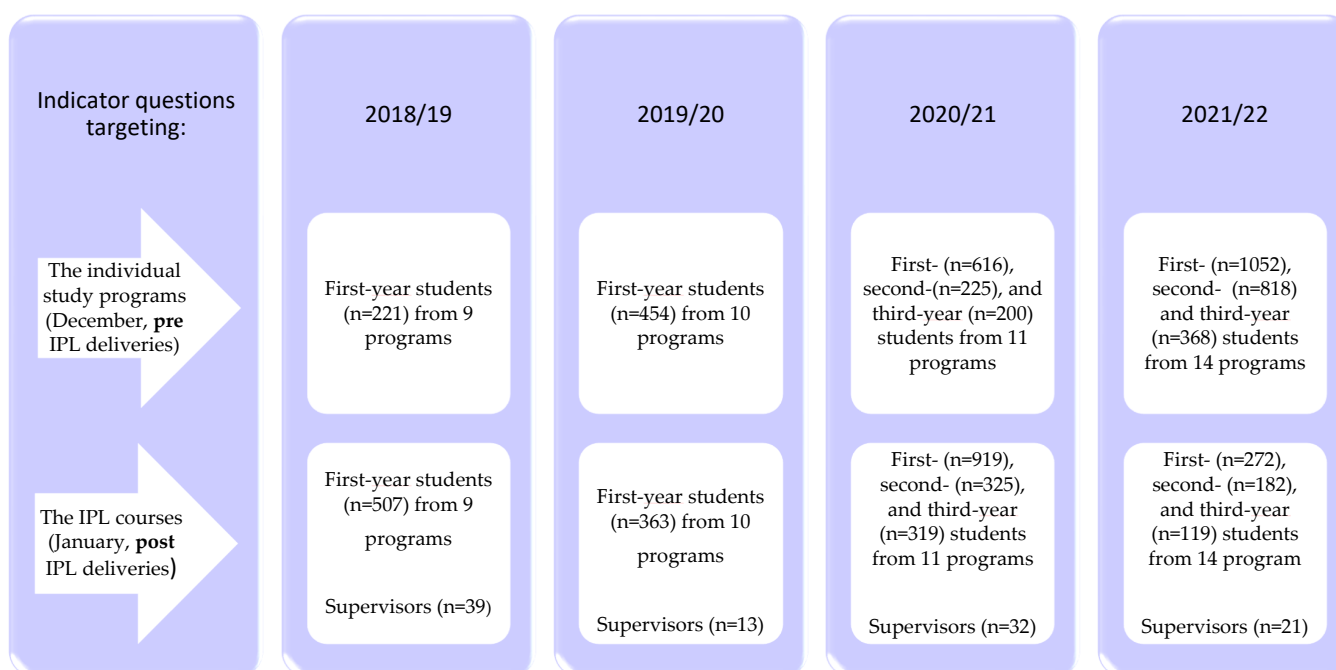


Figure 1. Flowchart of the Interprofessional learning (IPL) educational intervention study among health, social, and teacher educational study programs during the academic years 2018–2022.

2.3. IPL Course

In brief, undergraduate students participate in an annual IPL course integrated into the student curriculum that is structured as a combination of student-led case-based IPL group discussions with the use of digital learning materials delivered using the learning management system (LMS) Canvas [34]. There are three interprofessional modules in the curriculum [34], one in each curriculum year of study, as most undergraduate study programs last three years. The curricula throughout the three years of IPL comprise three elements: (1) a shared knowledge platform (first year, two seminar days), (2) explorative

communication with children (second year, two seminar days), and (3) interprofessional practice involving children, youth, and their parents (third year, two seminar day) (the total workload is estimated as six European Credit Transfer System [ECTS] credits). Although each year of study has a particular focus, the elements are not isolated items but rather parts of an integrated approach. The full-fledged IPL program is delivered according to initial (first curriculum year), intermediate (second curriculum year), and final (third curriculum year) levels of learning outcomes for IPL/IPC competencies and child-related topics [34].

Each of the IPL groups consisted of eight students aiming to represent the different study programs; the aim was to facilitate students in learning with, from, and about each other [1]. The students should collaboratively work together across study programs and future professions. The student-led groups followed a schedule that led them through tasks and discussions [40], which has been described in detail previously [56]. A specially prepared fictional complex case involving case-scenarios in which family members and different professionals were included, was embedded in the LMS Canvas, together with tasks to be solved by the students. The complexity was increased annually, as suggested by Jevne et al. [40]. It was presented on a Padlet, which is a commonly available online notice board. Posted notes contained links, videos, images, and document files and allowed the students to collaborate online. The intention was that students possessing distinctive knowledge bases would thereby develop a mutual understanding of how to work together in future professional environments. In the case-based IPL discussions, it was emphasized that the students should “play their future professional role” and take note of each other’s perspectives. Such case-based discussions did not have a “correct answer” but rather were designed to challenge the students to question their own knowledge and motivate them to seek new understanding [56]. This is a student-centered form of teaching, where the students’ learning needs are the central focus. The idea is to build knowledge for the future, and the immediate purpose is to create engagement among the students [40]. Efforts were made to even out potential differences between the student groups by making digital learning content available before the respective IPL seminars in a flipped classroom approach.

After feedback from students, stakeholders, and in response to the results of the pre-pandemic studies, the educational activities and content were adjusted along the way [56,58,59,67]; however, the course description and the major tasks remained unchanged.

During all three years of the curriculum, students could ask questions to their supervisors [56,67]. The supervisors were recruited from the staff, master’s degree students, and professionals working in the field [56]. They represented a broad range of ages, education, work experience, and supervisory backgrounds. All IPL groups received a visit from a supervisor, meaning that first- and third-year students were offered the same amount and type of supervision [67].

In the two consecutive online deliveries, Zoom breakout rooms using the gallery view served as online meeting rooms for the collaboration of the IPL groups [63]. In our pre-pandemic deliveries, no plenary sessions were included during the seminars because this was not possible with 1500–2000 students/curriculum year. After the transformation to the online mode, we were able to provide a brief introduction in 2020/21 and a plenary lecture in 2021/22 with the aim of highlighting topics to be elaborated on later in IPL group work.

Actions were taken with respect to the social online learning environment, such as ice-breaker activities and an initial session on how to establish a group, make a group contract, and establish various roles within a group, regardless of delivery mode [56]. A clear direction was laid on how the activities were to be led by the students during the session. At the same time, it was entirely up to each IPL group whether they followed this or not (it was expressed during course feedback that many experienced security in the clear direction, while others thought it was unnecessary because the collaboration went well anyway). None of the students were explicitly assigned the responsibility for peer-to-peer instruction or learning [56]. Concerning the social online learning environment, a positive atmosphere was stimulated through various online student activities, such as games to get acquainted.

2.4. Individual Study Programs

The study programs represented were health, social, and teacher education; these study programs are some of Norway's oldest, largest, and best-known programs of professional study. The programs have separate and distinct curricula, traditions, and identities. However, beginning in the 2020/21 academic year, IPL and/or multidisciplinary perspectives became a national requirement in undergraduate professional study programs [37,38], and thus participation in INTERACT educational initiative is mandatory for all professional students [56].

After the campus shut down due to the COVID-19 pandemic in March 2020 [65], all study programs were delivered in online mode, ranging from ERT to well-planned online learning designs. For the academic year 2020/21, to some extent, the individual study programs at OsloMet were allowed to include the delivery mode of campus activities if they complied with the disease control measures. In September 2021, most COVID-19 preventive measures initially introduced in March 2020 were removed in Norway [65]. Consequently, the students included in this study were offered a mixture of online, hybrid, or blended education for their respective study programs, and their learning and social environments at the university differed between the study programs.

2.5. Online Questionnaires

When the repeated cross-sectional design was initiated back in 2018, no suitable validated questionnaire was available translated into the Norwegian language. Thus, questions were specially prepared and developed according to the aims of the different pre-pandemic curricula. The purpose was twofold: (1) to examine students' experiences and receive feedback to improve the educational intervention, and also obtain knowledge related to educational quality and sustainability more in general along the way and (2) for research.

The questions were constructed to cover all students across study programs, curriculum years, and academic years, as well as the learning outcomes described in the course descriptions. The indicator questions were designed as indicators to target characteristics of both the respective uni-professional curricula and the IPL curricula. Drafts were discussed among students and colleges (academic and administrative) and accordingly revised. We wanted to keep the questionnaire as short as possible due to the risk of dropouts. Because the established data collection followed a sustainable approach in a situation in which we needed answers beyond the initial projects [65], such as COVID-19 pandemic measures relevant to higher education [66], new questions were added ad hoc after the first delivery. Due to the ever-changing situation and time constraints caused by the pandemic measures and adjustments, no pilot test was performed.

The students were asked identical, non-mandatory, closed-ended questions using neutral non-leading language and a six-point scale (from 0 = "completely disagree" to 5 = "completely agree") based on previous questionnaire-based quantitative research using the anonymous self-administrated web tool, Nettskjema [56]. Access to the questionnaire was provided using an internet link embedded in the students' LMS. Reminders were sent to increase the response rate.

2.5.1. Indicator Variables Repeated Eight Times (Four Years) (from the 2018/19 Academic Year)

In autumn 2018, students were asked about what they had learned in their respective study programs regarding "children and young people in general", "vulnerable/at-risk children and young people", "children's and young people's rights", "your own future professional role", "others' professional roles", "interprofessional collaboration", and "observation as a method" ("pre" questions targeting the individual study programs). These questions were repeated after the IPL course ("post" questions targeting the IPL deliveries).

2.5.2. Indicator Variables Repeated Six Times (Three Years) (from the 2019/20 Academic Year)

In autumn 2019, we added questions about “children as next-of-kin”, “verbal communication”, and “non-verbal communication” to the “pre” questionnaires and a question about “children as next-of-kin” to the “post” questionnaire. Additionally to the “post” questionnaires, new questions about the four core competencies (roles and responsibilities, values and ethics, interprofessional communication, and teams and teamwork) [2,68] were added, based on the translations by Iversen and Hauksdottir [42], after the removal of the references to health and social care. However, these translations are not validated; thus, we kept the specially prepared questions about roles and IPC initiated back in 2018.

2.5.3. Indicator Variables Repeated Four Times (Two Years) (from the 2020/21 Academic Year)

In autumn 2020, we added questions about “children in situations where the assistive device fails” and “children’s user participation”, both “pre” and “post.” In the “post” questionnaire we also added questions about “verbal communication” and “non-verbal communication”.

2.6. Data Analysis

Detailed data from the pre-pandemic cohorts (2018/19 and 2019/20 academic years) have been previously published [35,36,56–60], and are presently merged with data from the cohorts 2020/21 and 2021/22. Descriptive statistics were used to present the demographic data. Line charts with the mean and 95% confidence interval (CI) were used to summarize the variables (calculated from the scales) because a line chart highlights the overall pattern of the data and trends over time. As the study programs varied considerably in size, analyses were stratified by study programs dichotomized into teacher education and child welfare study programs and health and social care education programs, as well as by curriculum year, age, and academic year. Analysis was performed using independent samples *t*-tests and analysis of variance (ANOVA). To investigate whether there was any association between age, year of study, and education and the outcome variables, Pearson’s correlation was conducted. The significance level was set at $p < 0.01$. Because the questions were non-mandatory, the number of responding students varied for the different variables, but the total number of responding students was close to 7000. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 27.

2.7. Ethical Considerations

The Ethical Guidelines for Research at OsloMet were followed [69]. These guidelines are based on the Act Related to Universities and University Colleges for Ethics and Integrity in Research and pursuant regulations and related to the ethical norms prepared by the Norwegian National Committees for Research Ethics. The study does not include information about the health of respondents or others, and it was, therefore, not necessary to apply to the Regional Committees for Medical and Health Research Ethics (REC). It was also deemed unnecessary to inform the Norwegian Centre for Research Data (NSD) [70] as the study did not involve collecting personally identifiable information. However, we did send a request to the NSD (NSD reference number 741649) and received confirmation that the study was not subject to reporting requirements. Information was provided at the start of the questionnaire about the purpose of the study and what the student’s participation entailed, and it was stated that all data collected would remain anonymous. The data were collected from an anonymous online tool using Nettskjema [61], in line with ethical guidelines [69]. All participants were over 18 years old and received written information about the study beforehand on the LMS Canvas. The respondents’ voluntary participation and anonymity were emphasized, and they were informed about the study’s purpose and how the data would be used. Gender was not included due to the low number of male students in some study programs. The participants’ informed consent included the publication of

anonymized responses. Answering the questionnaire was considered informed consent to participate. The study complies with the Declaration of Helsinki.

3. Results

3.1. Response Rates

The questionnaire was answered by students from all the study programs included, with response rates of 49.6% (autumn 2020), 39.7% (January 2021), 46.0% (autumn 2021), and 11.4% (January 2022).

3.2. Demographic Characteristics

Approximately two-thirds of the students were 25 years old or younger (Table 1). The proportion of students enrolled in teacher education and child welfare programs and health and social care programs were evenly divided. In all cohorts, the proportion of first-, second-, and third-year students are in descending order.

Table 1. Characteristics of students ($n = 6963$). Numbers are stated as frequencies and percentages.

Variable	Academic Year 2020/21		Academic Year 2021/22	
	Pre IPL 2020 n (%)	Post IPL 2021 n (%)	Pre IPL 2021 n (%)	Post IPL 2022 n (%)
Age category (years)				
>21	419 (40)	642 (41)	886 (40)	200 (35)
22–24	291 (28)	454 (29)	633 (23)	132 (23)
25–27	136 (13)	199 (13)	284 (13)	69 (12)
≥28	195 (19)	271 (17)	435 (19)	172 (30)
Study program				
Early Childhood Education and Care	147 (14)	201 (13)	400 (18)	82 (14)
Teacher Education ¹	262 (25)	409 (26)	485 (22)	112 (20)
Supplementary Teacher Education	-	-	10 (0.4)	6 (1)
Teacher in Design, Arts, and Crafts ²	39 (4)	55 (4)	82 (4)	26 (5)
Social Work	105 (10)	170 (11)	205 (9)	58 (10)
Child Welfare	80 (8)	133 (9)	201 (9)	44 (8)
Occupational Therapy	50 (5)	47 (3)	67 (3)	14 (2)
Physiotherapy	65 (6)	80 (5)	131 (6)	38 (7)
Prosthetics and Orthotics	-	-	12 (0.5)	3 (0.5)
Paramedics	-	-	32 (1)	13 (2)
Nursing	250 (24)	409 (26)	470 (21)	140 (24)
Social Education	42 (4)	57 (4)	140 (6)	36 (6)
Education category				
Teaching and child welfare ³	528 (51)	798 (51)	1178 (53)	270 (47)
Health and social care ⁴	513 (49)	765 (49)	1058 (47)	303 (53)
Curriculum year				
First	616 (53)	919 (59)	1052 (47)	272 (48)
Second	225 (22)	325 (21)	818 (37)	182 (32)
Third	200 (19)	319 (20)	368 (16)	119 (21)

¹ Primary and Lower Secondary Teacher Education; ² Specialized Teacher Training in Design, Arts, and Crafts; ³ Early Childhood Education, Primary and Lower Secondary Teacher Education, Supplementary Teacher Education, Specialized Teacher Training in Design, Arts, and Crafts and Child Welfare; ⁴ Social Work, Occupational Therapy, Physiotherapy, Prosthetics and Orthotics, Paramedics, Nursing and Social Educator (education programs that lead to a license or authorization). Pre IPL: students responded to questions regarding their own study program during the autumn. Post IPL: students responded to questions after 1–2 days of the IPL (interprofessional learning) seminar deliveries in January.

3.3. Variables Repeated from the 2018/19 Academic Year

3.3.1. Learned in Their Own Study Program

The mean scores for all seven variables were significantly reduced for 2018–2022 among the health and social students (Figure 2) (all $p < 0.005$). Significant differences were also found among the teacher and child welfare students, for “children in general”,

“children’s rights”, “observation” and “your own future professional role” (all $p < 0.006$), with the lowest mean scores in 2020/21.

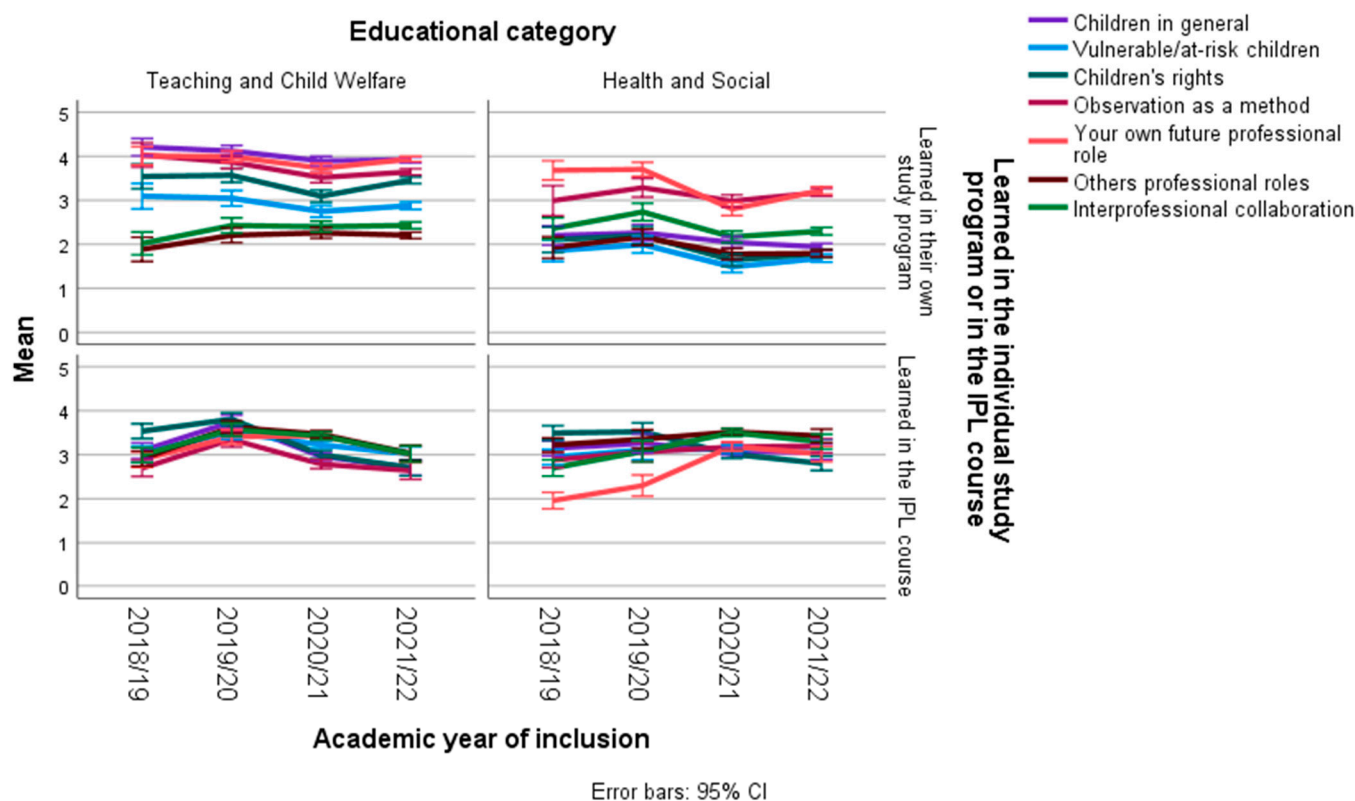


Figure 2. Student responses to statements (on a scale from 0–5) regarding what they learned in their own study programs ($n = 3954$) and in the IPL course ($n = 3009$) in the period 2018–2022.

3.3.2. Learned after the IPL Course

All mean scores were reduced among teacher education and child welfare students for the child-related topics, and for “children’s rights” among the health and social students (all $p < 0.0001$) (Figure 2). The highest mean scores were found for “your own future role”, “others professional roles”, and “interprofessional collaboration” in 2019/20 and in 2020/21, and for “observation” in 2019/20, among the teacher education and child welfare students (all $p < 0.01$) separately. The lowest mean scores were found in 2018/19 for “your own professional role”, “interprofessional collaboration” (both $p < 0.0001$), and with borderline significance also for “others professional roles” ($p = 0.019$), among the health and social students separately.

3.4. Variables Repeated from 2019/20 Academic Year

3.4.1. Learned in Their Own Study Program

For the three variables added to the “pre” questionnaire for the 2019/20 academic year, mean scores were reduced for both education groups among the first-year students ($p < 0.0001$) (Figure 3) (pre-pandemic data are not available for second- and third-year students). No significant differences were found for the second-, and third-year teacher education and child welfare students. Among the health and social students separately, significant reductions in mean scores were found for “verbal communication” and “non-verbal communication” among second-year students (both $p < 0.0001$), whereas “nonverbal communication” was increased among the third-year students ($p = 0.009$).

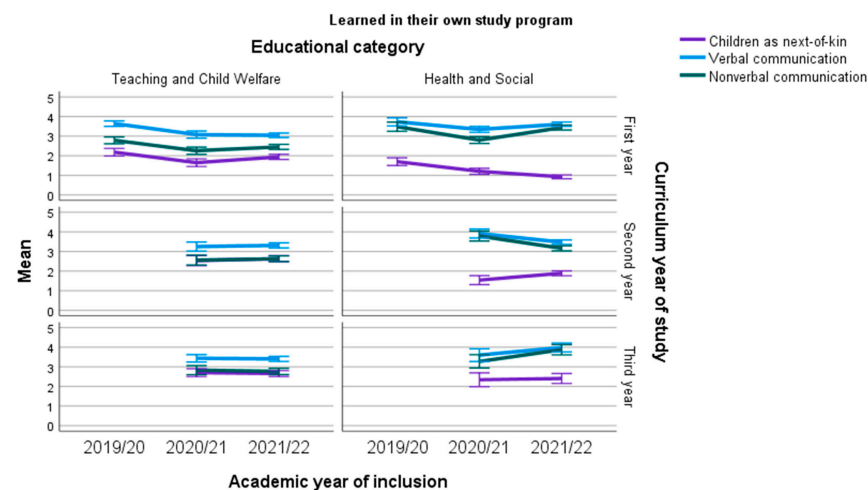


Figure 3. First ($n = 2343$), second ($n = 1043$), and third ($n = 568$) curriculum year teaching and child welfare ($n = 2057$) and health and social care students ($n = 1895$): responses to statements (on a scale from 0–5) regarding what they learned in their own study programs.

3.4.2. Learned in the IPL Course

Among the four variables added to the “post” questionnaire (Figure 4), means scores were significantly decreased for “teams and teamwork” ($p = 0.01$) among the first-year teacher education and child welfare students, and for “values and ethics” and “roles and responsibilities” for the second-year teacher education and child welfare students (both $p < 0.0001$). Among the health and social care students separately, “roles and responsibilities” and “interprofessional communication” were increased (both $p < 0.001$) among first year students, but not among the second- and third-year students.

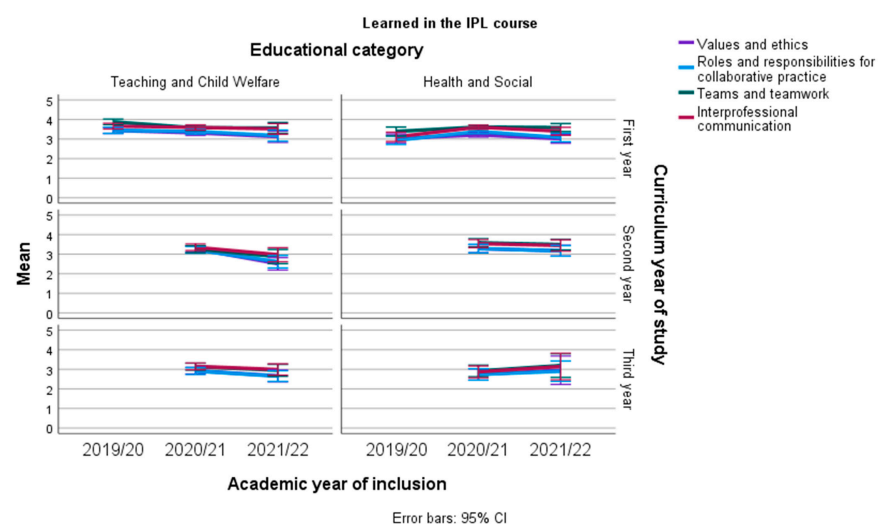


Figure 4. First- ($n = 2061$), second- ($n = 507$), and third-year ($n = 438$) teaching and child welfare students ($n = 1549$) and health and social care students ($n = 1457$): responses to statements (on a scale from 0–5) regarding what they learned in the IPL course.

3.5. Variables Measured for Two Consecutive Years from 2020/21

3.5.1. Learned in Their Own Study Program

For the two variables added (“children in situations where the assistive device fails” and “children’s user participation”), the mean scores were similar in 2020/21 and 2021/22, except for a decreased mean score for “children’s user participation” among the teacher education and child welfare students in 2022 ($p < 0.0001$).

3.5.2. Learned in the IPL Course

All mean scores were reduced in 2021/22 as compared to 2020/21, but reached statistical significance only among the teacher and child welfare students ($p < 0.004$).

3.6. First, Second, and Third Curriculum Year Students

3.6.1. Learned in Their Own Study Program

The third-year students had learned significantly more than first-year students for all topics in their individual study programs (all $p < 0.009$) (Figures 5 and 6), except for similar scores for “verbal communication” ($p = 0.12$), “non-verbal communication” ($p = 0.04$), and “teams and teamwork” ($p = 0.66$) among the health and social care students.

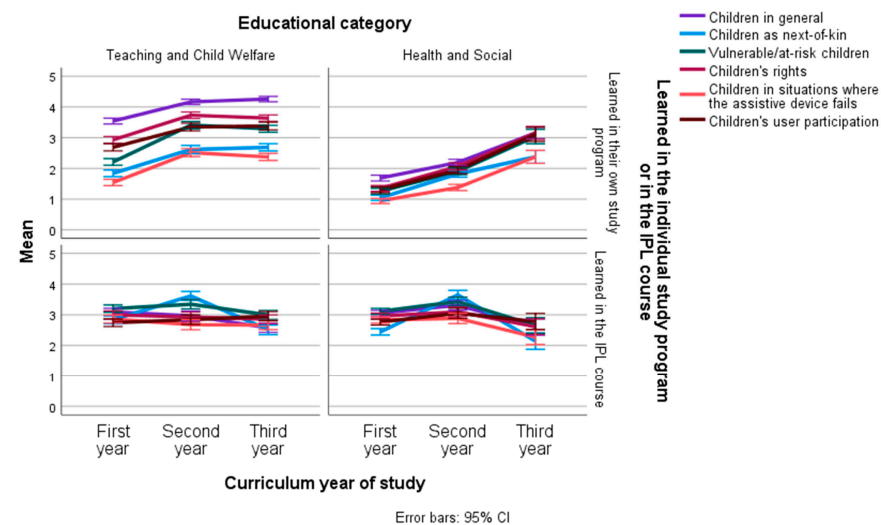


Figure 5. Stratified analysis for curriculum year of study and child-related topics: student responses to statements (on a scale from 0–5) regarding what they learned in their own study programs ($n = 3954$) and in the IPL course ($n = 3009$).

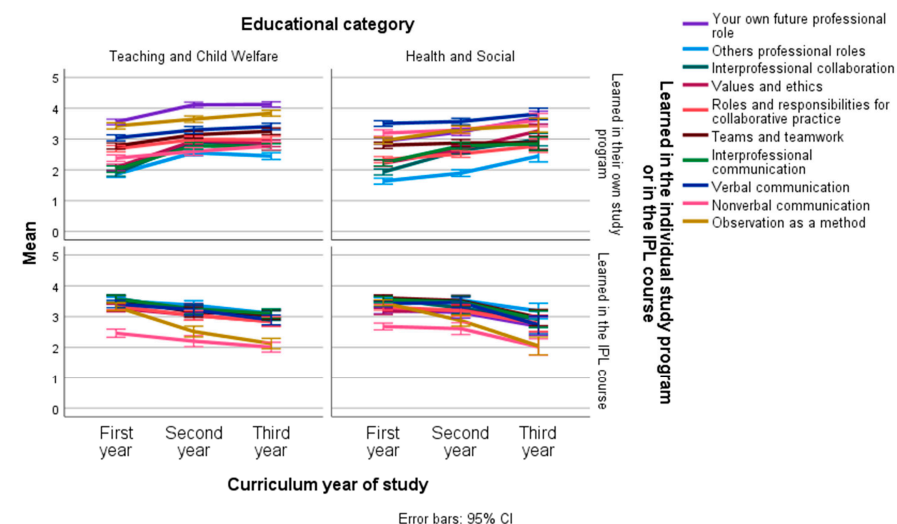


Figure 6. Stratified analysis for curriculum year of study and IPL/IPC competencies: student responses to statements (on a scale from 0–5) regarding what they learned in their own study programs ($n = 3954$) and in the IPL course ($n = 3009$).

3.6.2. Learned after the IPL Course

The third-year teacher education and child welfare students had significantly lower mean scores than the first-year students for all topics (all $p < 0.006$), except for “children in situations where the assistive device fails” ($p = 0.08$) and “children’s user participation”

($p = 0.08$) (Figure 5). An overall decline in mean scores was found for third-year health and social care students (all $p < 0.009$), except that the second-year students had the highest mean scores for the values “others’ professional role” ($p = 0.02$) and “children’s user participation” ($p = 0.02$) (Figure 6).

3.7. Differences between the Educational Groups According to Curriculum Year

Regarding what they learned in their own study program, the first-year teacher education and child welfare students ($n = 1103$) learned more in their own study programs than the first-year health and social care students ($n = 1227$) for all topics, except for “vulnerable/at-risk children” ($p = 0.07$), “children’s rights” ($p = 0.044$), “values and ethics” ($p = 0.13$), and “roles and responsibilities” ($p = 0.013$). The second-year teacher education and child welfare students ($n = 488$) learned more in their own study programs than the second-year health and social care students ($n = 550$) for all topics, except for “vulnerable/at-risk children” ($p = 0.43$), “others’ role” ($p = 0.14$), “teams and teamwork” ($p = 0.19$), “verbal communication” ($p = 0.85$), and “non-verbal communication” ($p = 0.72$). The only variable that reached significance among the third-year students was a lower mean score among the teacher education and child welfare students for “non-verbal communication” ($p = 0.005$). However, borderline higher scores among the teacher education and child welfare students were found for “your own role” ($p = 0.011$), “others’ role” ($p = 0.05$), and “observation as a method” ($p = 0.015$), and lower scores were found for “interprofessional communication” ($p = 0.012$) and “verbal communication” ($p = 0.10$) compared to the health and social care students.

Regarding what they learned after the IPL course, the first-year teacher education and child welfare students had higher mean scores for “their own role” ($p < 0.0001$) and borderline higher scores for “interprofessional communication” ($p = 0.017$) and “children as next-of-kin” ($p = 0.046$). For the second- and third-year students, no difference reached $p < 0.01$. However, among the second-year teacher education and child welfare students, a lower mean score was found for “values and ethics” ($p = 0.032$), and among third-year teacher education and child welfare students, a higher mean score was found for “your own future role” ($p = 0.02$).

3.8. Differences According to Age

3.8.1. Learned in Their Own Study Program

Except for “roles and responsibilities for collaborative practice” ($p = 0.2$), “teams and teamwork” ($p = 0.05$), “verbal communication” ($p = 0.88$), and “non-verbal communication” ($p = 0.56$), significant p values for all variables were found ($p < 0.003$) (Figure 7).

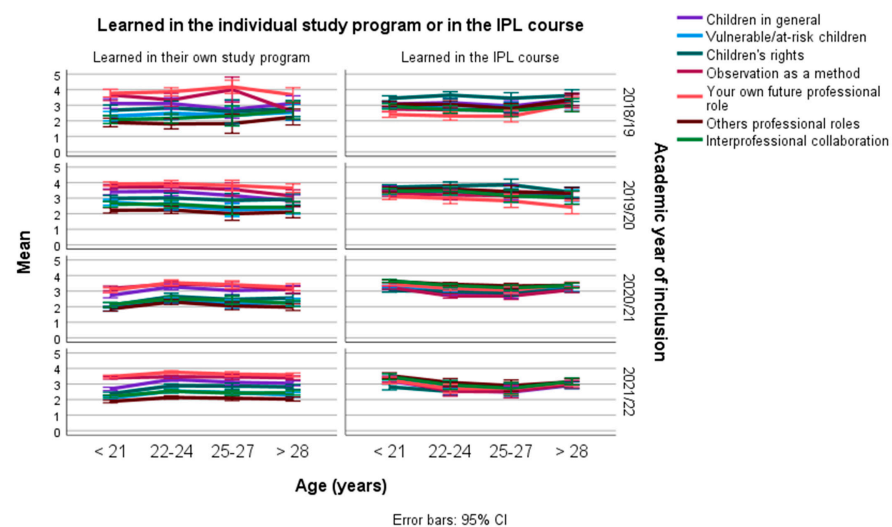


Figure 7. Cont.

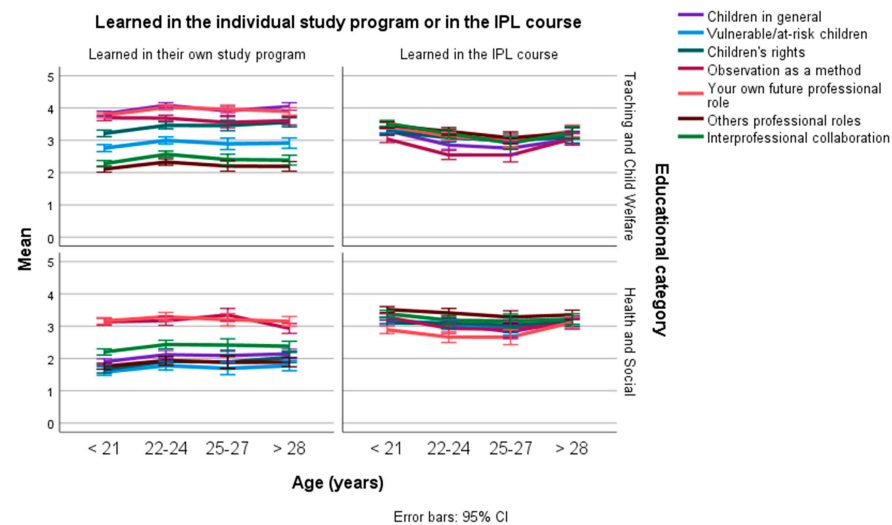


Figure 7. Stratified analysis for age category: student responses to statements (on a scale from 0–5) regarding what they learned in their own study programs ($n = 3954$) and in the IPL course ($n = 3009$), according to academical year of inclusion and educational study programs.

3.8.2. Learned after the IPL course

Except for “children’s rights” ($p = 0.2$) and “children’s user participation” ($p = 0.3$), significant p values were found ($p < 0.002$) for all variables.

3.9. Overview of All Individual Study Programs

Table 2 shows the mean scores and standard deviation for the variables for the individual study programs, along with the large differences in the number of respondents.

Table 2. Learned in their own study program ($n = 3952$) Mean and standard deviation (SD) ^{1,2}.

Study Program <i>n</i>		Children in General	Children as Next-of-Kin	Vulnerable /at-Risk CHILDREN	Children's Rights	Your Own Future Role	Others' Professional Roles	Interprofessional Collaboration	Values and Ethics	Roles and Responsibilities	Teams and Teamwork	Interprof Communication	Verbal Communication	Nonverbal Communication	Observation as a Method
Kindergarten	667	4.1 (1.1)	2.4 (1.5)	2.6 (1.4)	3.5 (1.3)	3.9 (1.1)	2.1 (1.4)	2.3 (1.4)	2.5 (1.4)	3.1 (1.4)	3.1 (1.3)	2.4 (1.4)	3.4 (1.2)	3.0 (1.4)	4.0 (1.1)
Child Welfare	331	4.4 (0.9)	3.1 (1.4)	4.1 (1.2)	4.4 (1.0)	3.8 (1.2)	2.5 (1.2)	2.7 (1.2)	2.9 (1.2)	2.9 (1.2)	2.7 (1.3)	2.6 (1.2)	3.5 (1.2)	3.2 (1.3)	3.1 (1.4)
Occupational Therapy	162	2.7 (1.3)	1.3 (1.3)	2.0 (1.4)	1.7 (1.4)	3.3 (1.4)	1.9 (1.3)	2.8 (1.4)	2.4 (1.3)	2.1 (1.3)	3.1 (1.3)	2.8 (1.4)	3.3 (1.3)	2.6 (1.5)	3.4 (1.5)
Teacher in Design, Arts, and Crafts ²	149	3.4 (1.4)	1.8 (1.6)	2.4 (1.6)	2.4 (1.5)	3.6 (1.2)	2.0 (1.3)	2.1 (1.4)	2.1 (1.4)	2.5 (1.4)	2.9 (1.3)	2.1 (1.4)	3.0 (1.4)	2.1 (1.5)	3.2 (1.4)
Physiotherapy	286	1.5 (1.2)	0.73 (1.0)	1.0 (1.1)	1.2 (1.3)	3.1 (1.5)	1.6 (1.3)	2.2 (1.3)	2.3 (1.4)	2.1 (1.5)	2.8 (1.5)	2.3 (1.4)	4.0 (1.2)	3.9 (1.3)	3.3 (1.6)
Teacher Education ¹	900	3.8 (1.1)	2.0 (1.4)	2.6 (1.3)	3.1 (1.3)	4.0 (1.0)	2.2 (1.3)	2.4 (1.3)	2.5 (1.3)	2.8 (1.3)	3.1 (1.3)	2.5 (1.3)	3.2 (1.3)	2.2 (1.4)	3.8 (1.1)
Supplementary Teacher Education	10	3.8 (1.3)	3.3 (1.5)	2.6 (1.4)	3.8 (1.0)	4.5 (0.7)	3.5 (1.0)	3.2 (1.1)	3.9 (1.0)	3.9 (0.9)	3.6 (1.3)	3.5 (1.3)	3.5 (1.1)	2.9 (0.9)	3.2 (1.0)
Mensendieck	40	1.4 (1.2)	0.7 (0.9)	1.0 (1.1)	1.0 (1.2)	3.4 (1.2)	1.6 (1.4)	2.2 (1.4)		-	-	-	4.3 (1.1)	4.2 (1.1)	4.3 (1.3)
Prosthetics and Orthotics	12	1.3 (0.8)	0.3 (0.9)	1.2 (1.2)	1.8 (1.1)	3.4 (1.2)	2.3 (1.1)	2.8 (1.5)	3.0 (1.0)	2.4 (1.0)	2.8 (0.9)	3.0 (1.3)	2.8 (0.9)	2.5 (1.1)	2.4 (1.2)
Paramedics	32	1.3 (1.2)	0.8 (1.2)	0.9 (1.3)	1.0 (1.2)	3.7 (1.2)	1.5 (1.3)	1.7 (1.0)	2.2 (1.4)	2.1 (1.4)	2.7 (1.5)	1.9 (1.4)	3.2 (1.5)	2.4 (1.7)	2.3 (1.7)
Social Work	386	2.6 (1.2)	1.9 (1.3)	2.6 (1.4)	2.8 (1.4)	3.5 (1.2)	2.1 (1.2)	2.2 (1.3)	2.8 (1.4)	2.4 (1.3)	2.4 (1.3)	2.2 (1.3)	3.5 (1.4)	3.3 (1.5)	2.8 (1.5)
Nursing	792	1.8 (1.4)	1.6 (1.4)	1.4 (1.4)	1.5 (1.4)	3.0 (1.6)	1.7 (1.5)	2.2 (1.5)	2.3 (1.5)	2.4 (1.4)	3.0 (1.5)	2.6 (1.5)	3.7 (1.3)	3.5 (1.5)	3.2 (1.5)
Social Education	182	2.1 (1.3)	1.2 (1.3)	2.1 (1.4)	2.3 (1.4)	3.4 (1.3)	2.3 (1.4)	2.8 (1.4)	2.8 (1.4)	2.9 (1.4)	2.9 (1.4)	2.7 (1.3)	3.1 (1.3)	2.3 (1.4)	2.8 (1.4)

¹ Primary and Lower Secondary Teacher Education; ² Specialized Teacher Training in Design, Arts, and Crafts.

4. Discussion

A unique trait of this study based on responses from close to 7000 Norwegian professional students is the inclusion of three different curricular years, using a spiral curriculum approach [34,45]. The cohort who started their studies in autumn 2019 took the first-year IPL course in January 2020, the second in January 2021, and the third in January 2022. These students learned about the selected indicator topics in their individual study programs, which was to be expected. In contrast, their responses to the same indicator questions after participating in the IPL course imply that the IPL course needs improvements, and particularly so for the third-years students. Overall, the students learned less in their own study programs after the pandemic outbreak. The responses regarding the IPL deliveries varied according to educational background. The significant differences between teacher education and child welfare students and health and social care students may reflect IPC challenges in working life.

4.1. The Delivery Mode

The lower mean scores after the pandemic outbreak and the consistently smaller spread in responses with reference to the well-planned IPL compared to the individual study programs are novel findings of this study.

Although the different individual study programs may have been, or moved on to be, well-planned online learning deliveries rather than ERT, the potential impact of such misclassification would have been small due to the large sample size and the repeated measurements. The IPL course was a single, well-planned IPL educational initiative in which the first online delivery coincided with the pandemic and not an ERT. The individual study programs differ from each other, such as by having different curricula, student volumes and supervision traditions [67]. Any challenges due to the pandemic, and not the delivery mode, would have been equally prone to affect the responses toward both the individual study programs and the IPL course. The finding that the students were more divided regarding their own study programs than the IPL course, therefore, lends credibility to our data.

The present study agrees with our previous pre-pandemic studies: teacher education and child welfare students and health and social care students are not equally prepared for IPL [57], and they gain different learning outcomes from the IPL course [35,36,58,60]. The present study supports that IPL remains a significant challenge when multiple professional groups are included [29,71,72]. As highlighted by van Diggele et al. [71], the lack of curricular or case relevance across educational specialties is a significant challenge in IPL delivered to different study programs, even when restricted to health care.

The drop in observation ability, as well as verbal and non-verbal communication in 2020/21, lend credit to our study, partly because the learning outcomes were reduced overall for all educational topics, but more importantly, because the online mode may not capture the nuances of in-person interactions and communication.

4.2. The Three-Year Annual Curriculum

The results of this study show a lack of progression through the three annual curriculum years. One explanation suggested by the supervisors [67] may be that the teacher education and child welfare students found that the academic approach was both too low-level and repetitive and that the health and social care students felt that the curriculum was not relevant to their future profession or work life, regardless of curriculum year. A possible implication of the unequal knowledge bases [57,60] may be that the students were unequally able to generalize from what had been learned and applied in other working life-relevant scenarios [45,49]. In line with this, Campbell argues that linking theory and practice is a complicated task in a spiral curriculum [48] because “significant cognitive load demand placed on students in an unfamiliar laboratory setting reduces the ability of students to think clearly about the theory underpinning the task at hand.” Even within one single education discipline, chemistry subjects, students can find it challenging to apply

knowledge gained in one subject to situations in another subject [48]. Our findings may thus imply that the third-year students did not respond in line with the suggested [49] advantage of a gradually expanding curriculum and case [40].

The indicator variables were selected because they were assumed to capture aspects and curricular features from both the uni-professional study programs and the IPL curriculum. The three elements—(1) a shared knowledge platform; (2) explorative communication with children; and (3) interprofessional practice involving children, youth, and their parents [34] are interwoven in accordance with the theory that the starting point of a spiral approach should be something the students know about or can relate to [45]. The present data shows that the second-year students, in particular, learned about “children as next-of-kin,” which fits the revised digital content [56] presented in the LMS. However, regarding the third curriculum-year students, all the mean scores are reduced. Whether the third-year students were more comfortable than the first-year students in working with unfamiliar peers is not tested in the present design. However, the drop between the second and third curriculum years is not suggestive of such an assumption. The present results accord with the suggestion that a spiral approach is less efficient for complex subjects and may lead to misconceptions in early learning which persist into advanced study [49]. In addition, in a large study from the United Kingdom [3,73] among 10 different health and social care study programs, increasingly negative trends were found during education for IPL/IPC, whereas qualified practitioners were more positive about other professionals’ interactions [74].

Material that was perceived as easy and difficult to master [49] was probably not the same for students in different study programs. In contrast to uni-professional study programs, a major challenge in IPL is different professional disciplinary terminologies, identities, cultures, traditions, and syllabuses, all of which can act as barriers to professional collaboration and teamwork [72]. Thus, the suggested advantage of spiral learning [49], in which simple topics can be introduced and then expanded to complexity, may not be the best pedagogical approach in complex IPL settings.

In line with the results of the present study, Coelho and Moles [52] wonder if clarity can be achieved regarding where students’ learning should stop or be deemed sufficient at a particular stage in the spiral, without clear knowledge of the revisiting point. Ideally, students from two or more professions should learn about, from, and with each other to enable effective collaboration and improve health outcomes [1]. The strongest university students may study beyond what is required, and this may be a particular challenge with longitudinally running themes [51], as in the present study.

Based on experiences from uni-professional studies, it has been suggested that students’ understanding of how a spiral curriculum works over years may be enhanced with time [52,53]. The teacher education and child welfare students in general seemed to have a stronger sense of their own future professional role [57,60,72], which may be important in this context. Teacher education students are trained to work alone in front of a class of pupils, whereas the other students are trained to work with colleagues in teams. Additionally, the IPL curriculum and individual study program curriculum may overlap. When curriculum intentions become intertwined, students may perceive, either implicitly or explicitly, that competing agendas between disciplinary and IPL activities are in play [75]. Thus, our results may imply that these third-year teacher education and child welfare students may have been more prone to be affected by disciplinary imperatives that usually take precedence, focusing predominantly on their own profession [75], leading to lower IPL scores.

Notably, in our previous study [63], we found that the teacher education students agreed, to a relatively greater extent, that a breakout room is a suitable platform for team-based IPL discussions, and for training on talking about sensitive topics. The health students agreed to a larger extent that such pre-service training would lead to better future IPC. The previous findings and the present findings are in agreement with studies that have shown that teachers claim they lack competence and confidence and that they experience uncertainty about their role concerning pupils with challenging childhood experiences,

such as abuse and domestic violence [14,15,76,77]. Such aspects might not have been sufficiently accounted for when designing the third-year IPL course. The IPL course could be improved by a cumulative curricular effect of preparing all the different student groups for future challenging experiences in their professions such as navigating adverse childhood experiences for their clients and mandatory reporting.

All professional students need to prepare for complex working situations targeting vulnerable users; thus, working uni-professionally with familiar peers was not an alternative. Group dynamics is fundamental for learning outcomes in group work [78], and these students might not have been adequately trained in group processes or those involving persons they did not previously know. We assume that our results may partly be due to a lack of generic skills [79] among the students, such as communicating, problem-solving, curiosity, patience, flexibility, resilience, courage, and creativity skills. Such skills are associated with helping to organize, adapt, and strategically apply specific skills in new situations and circumstances [79], and they are transferable across a variety of professions, study programs, and life contexts. Against this backdrop, we may not exclude that our results are both due to the delivery of the curriculum and to the effects of the curriculum [49,80].

The course could also be improved by game-based training which is an effective way to train many people at the same time, and a way to stimulate collaboration and team learning [63]. The idea of educational games is that those who do the right things in the games also do the right things in the real world. For the January 2023 delivery of the IPL courses, a simulation of teamwork developed at OsloMet for OsloMet students is included in the courses. In the course for the third-year students, a new case has been developed. According to a new legislative measure from autumn 2022 [39], the Norwegian municipalities are required to have a child coordinator to coordinate the welfare services to children with special needs. This new legislative measure and its consequences are included in all three courses, with a brief introduction for first-year students and a more thorough discussion for second- and third-year students.

Overall, across age, year of academic study, and education, these students responded that they “learned with, from, and about other students” [63]. The significant differences between teacher education and child welfare students and health and social care students may reflect IPC challenges in working life. Although the IPL course needs improvements, in particular for the third year students, the potential for providing students with knowledge of and experience with interprofessional cooperation as well as interprofessional experience [34] is promising. The courses are developed each year according to feedback from students, teaching staff, and supervisors. The course for third-year students has been offered only twice and is still in the development process.

4.3. Limitations and Strengths

The strengths and limitations of the design and methods have been outlined in previous papers [35,36,56–58,60,63,64,72]. In brief, to overcome limitations due to selection bias, self-reported data, and the design, we used data from four consecutive years, which is a “pseudo-longitudinal” design [33]. The study’s major strengths include the large cohort size with students from health, social, and teacher education study programs, the repeated cross-sectional design, the inclusion of students from three different curriculum years of study, the anonymous data collection method, the use of indicator questions, and the response rate. There was also no time lag between exposure and questions, which reduced the risk of recall bias, which may be of particular importance during unpredictable situations, such as a global pandemic outbreak.

The present response rates were higher than the response rates to the national student survey in Norway (Studiebarometeret) among 74,000 Norwegian students, which were 44% in 2020 and 41% in 2021 [81], and they were higher than those of our cross-sectional studies before the pandemic [56,58,60], except for a low response rate of 11.1% after the IPL intervention in 2022. Calculation of the response rates was challenging because these students were not participating in a research project with close follow-up, but as part of

a mandatory educational delivery. The students may quit their studies or be delayed for reasons such as parental or sickness leaves. Relevant information is not automatically transferred from the individual study programs to INTERACT and, thus, the true response rates might be somewhat higher than reported.

The major explanation for the decreasing participation rate is that the individual study programs were gradually enrolled, starting with first-year students. Moreover, it is not unusual that bachelor study programs in Norway have a drop-out rate of around 25%. Although the response rate in this study is high, we assume that the third-year students are less motivated to respond compared to the first-year students. However, even the number of third-year students was close to 1000 students.

It was not possible to design this study with a control group since this is a mandatory course for all professional study programs at our university. Instead, students were asked similar indicator questions with reference to both their own study programs and the IPL course. For example, subjects covering observation and verbal and non-verbal communication are fundamental in all professional study programs. The present findings demonstrate that all the individual study programs include these basic topics and that the indicator questions were adequate for the present purpose. No validated questionnaire is available in the Norwegian language targeting the present purpose. Future studies should explore the reliability and validity of the questions for evaluating this educational initiative longer term.

We realize that some students may have scored zero because they had returned to in-person teaching on campus on their own study programs or had practical training in the welfare services. However, the impact of such misclassification is assumed to be small. The consistent and separate patterns concerning their own study programs and the IPL course lend credibility to our study.

The 2021 cohort responded while under preventive lockdown measures due to the upcoming third wave of infection. In 2022, the educational delivery modes varied (physical, digital, blended, hybrid) among the study programs [65]. Thus, the students who responded were not a homogenous group but rather had varied experiences—but the results are nonetheless consistent. There is greater concern regarding a possible self-selection bias. Participants with strong opinions in either direction might have responded, but the diversity of our cohort and the sample size enhances the robustness of our findings. For this study, if students with strong opinions responded in both directions, the average would not be affected.

A number of external changes had to be dealt with along the way, such as the implementation of two large national educational reforms from the study year 2020/21 [37,38], the transition from a university college into a university in 2018, and the outbreak of the COVID-19 pandemic in March 2020 [65]. This longitudinal research study was designed to not affect the individual students, the study programs, nor jeopardize the IPL intervention. Data on the individual level was not possible for ethical, technical, and practical reasons. Since participation is voluntary and anonymous, we do not know if the same students answered two or three questionnaires, and it was not possible for the researchers to see who answered what regarding the responses. The composition of the IPL groups changed each year, partly because of limitations in our administrative system, but also because students may quit their studies, are on leaves, or are delayed.

Due to the study programs being a mixture of small and large programs, some IPL groups may have been perceived as professionally unbalanced, or perhaps too many professions were included [63]. IPL is difficult even within health education study programs only, and the success of IPL is also dependent on the relevance of the topics and tasks being included to the students involved. Some students may have given negative responses because the tasks appeared unrealistic or because there was an imbalanced group composition.

4.4. Generalizations from Our Experience to IPL Targeting Teacher, Social, and Health Care Education

Including teachers and child welfare students in IPL entails added levels of complexity in IPL, because these student groups are not attaining study programs targeting all stages of life (childhood, adolescence, adulthood, and old age). The different study programs have different terminology, traditions, syllabus, and working methods, and thus the students' knowledge bases of both child-related topics and IPL/IPC, is uneven. The different student groups' future work situation is also not comparable, which may be reflected in how they are supervised during their practical training and also during IPL/IPC [67].

Our advice to minimize barriers and obstacles and to increase the learning outcomes for students from both teacher, social, and health study programs include structural, pedagogical, ethical, and legal aspects:

Structural:

- Close collaboration with the individual attaining study programs in preparing the students for IPL and IPC, to ensure relevance for all study programs;
- Train the students in both physical, hybrid, blended, and digital collaboration and communication ahead of IPL;
- Ensure that the student groups are truly interprofessional, as unbalanced IPL groups will reduce the learning outcome for all the participating students. The size of the student groups should be considered. Smaller groups could favor more student activity;
- Place the students in groups with unfamiliar peers but provide them with tools to strengthen their generic skills and optimize group dynamics;
- Revise the IPL deliveries each year according to feedback from students, teaching staff, supervisors, and working life, to keep updated with changes in society and legislation;
- Embrace IPL/IPC as a catalyst for needed changes in education, such as approaching sustainability goals.

Pedagogical:

- Use small group learning and student active methods;
- Include game-based training or simulation to stimulate collaboration and team learning;
- Reduce the IPL curriculum to a minimum;
- The most significant learning outcome for the students is the group discussion and, thus, learning resources stimulating real-life realistic group discussions perceived as relevant for all student groups, are crucial;
- Include current cases from the news headlines and challenge each student to prepare themselves ahead of IPL to present their own professional role and legal responsibilities with respect to that case;
- Consider adding a plenary session summing up the tasks or substituting the supervision component with a plenary session;
- Communicate clearly that different opinions between the student groups may reflect IPC challenges in working life and that other views should be welcomed.

Ethical and legal aspects:

- Teach the students about GDPR and IPL/IPC, particularly concerning the grey zones;
- Collaborate with the individual study programs to prepare the students concerning legislation, duties of confidentiality, but also sources of challenges such as different terminology, procedures, and understandings of what is in the best interest of the child;
- Prepare all the different student groups for future challenging experiences in their professions such as navigating adverse childhood experiences for their clients and mandatory reporting.

5. Conclusions

The annual IPL curriculum was not associated with a progression of mean scores for the IPL indicators but rather a decline among the third-year students. In contrast, a steady increase for the same indicators for the individual study programs was found. The

transformation to the online delivery mode resulted in overall lower scores. A comparison with the responses to the online delivery of the individual study programs suggests that the decreased learning outcomes from year 2 to year 3 for the IPL initiative are not due to the online delivery mode. The lack of reported progress in the IPL courses from year 2 to year 3 is more likely due to students not experiencing a gain in learning outcomes for IPL. Some students may have given negative responses because the tasks appeared unrealistic or because there was an imbalanced group composition. Most likely, the students had experienced interprofessional collaboration in practical training and gained knowledge and skills through their coursework in the third and fourth semesters in their own study programs. This might not have been sufficiently accounted for when designing the third-year IPL course and demonstrates the need for further development of the course to ensure a higher learning outcome for the students. The course for third-year students has been offered only twice and is still in the development process. The IPL courses are continuously developed according to feedback from students, teaching staff, supervisors, and representatives from work life.

This article presents how our institution delivered complex IPL in the period of 2018–22, and due to the transfer value to similar educational initiatives, we have included recommendations for similar IPL deliveries. IPL/IPC should be embraced as a catalyst for needed changes in education, such as approaching sustainability goals and meeting emerging societal needs.

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