Developing an effective IPE learning activity for midwifery and medical students: Use of a quality improvement model and researcher-teacher partnership methodology

Sonya Morgan,* Judy Ormandy, Christine Jackson, Lyndal Honeyman, Rose Spence, Robyn Maude, Eileen McKinlay

Abstract: *Background.* There is little guidance available about how to develop effective interprofessional learning activities for midwifery and medical students to prepare them for future collaboration in the workplace. *Purpose*. This paper aims to describe how the use of a quality improvement methodology and researcher-teacher partnership approach improved an interprofessional education learning activity developed for pre-registration midwifery and medical students. *Method*. Employing a collaborative researcher-teacher approach, two iterations of the learning activity refined over two quality improvement cycles were undertaken. Mixed methods of data collection were used to assess each iteration. Modifications were made to the second iteration of the interprofessional education learning activity based on feedback from the first iteration. *Discussion/Conclusions*. Analysis of the second interprofessional learning activity modified according to feedback from the first iteration indicated improved learning outcomes. The study demonstrates the value of using a quality improvement methodology coupled with a researcher-teacher partnership to develop an effective interprofessional education learning activity for midwifery and medical students which has potential to increase workplace collaboration.

Keywords: curriculum design; interprofessional education; medical students, midwifery, quality improvement; quality improvement methods; researcher-teacher partnership; workplace learning

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Date accepted: 12th Agust 2024

Date of first (online) publication: 18th February 2025

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Introduction

Effective interprofessional education (IPE) opportunities, where two or more professions learn with, from and about each other during their professional training (Centre for the Advancement of Interprofessional Education, 2017) are needed for midwifery and medical students to prepare the two professional groups for future collaborative relationships in the workplace. This form of working is known as interprofessional collaboration (IPC), and is understood as health professionals from different

professions intentionally working together to achieve common goals in the workplace (Frenk et al., 2010; World Health Organisation, 2010). IPC requires different health professionals to work effectively together, not just alongside each other, to deliver optimal outcomes (Howkins & Low, 2014), and is known to be essential to the provision of safe, quality maternity care (Harris et al., 2002). Yet, effective collaboration between midwifery and medicine does not always occur and is an area identified as requiring urgent attention internationally (Perinatal and Maternal Mortality Review Committee, 2018; Dyer, 2023; Wilkinson, 2023). Given successful IPE experiences are likely to facilitate IPC in the future workplace (World Health Organisation, 2010; Bogossian & Craven, 2021; Spaulding et al., 2021; Baecher-Lind et al., 2022), developing effective IPE opportunities for midwifery and medical students is an important means to addressing this concern.

In Aotearoa New Zealand (NZ) to date, there have been very few instances of IPE between pre-registration midwifery and medical students. Initiatives that have occurred have been one-off pilots (Ormandy & Austin, 2021; Daellenbach et al., 2023). This and Australian research suggests midwifery and medical students have little knowledge of each other's practice roles and contributions to maternity care (Quinlivan et al., 2002; Daellenbach et al., 2021; Daellenbach et al., 2023). There are also limited international examples with guidance for teachers working in higher education settings about how to develop effective IPE learning activities for these two student groups. What is known from these examples are the challenges typical to IPE in general: logistical timetabling difficulties (Symonds and Fraser, 2003; Fraser et al., 2005; Murray-Davis et al., 2013; Avery et al., 2020), selecting matched training levels of midwifery and medical students (Murray-Davis et al., 2013; Avery et al., 2020), unequal professional group composition in learning activities (Fraser et al., 2005; Murray-Davis et al., 2013; Burns et al., 2020), 'power play' dynamics (Murray-Davis et al., 2013; Burns et al., 2020) and selecting learning content appropriate for both professions (Fraser et al., 2005).

Quality improvement approaches widely used in clinical practice, such as the plan-do-study-act cycle (Taylor et al., 2014) with feedback-improvement loops, may provide useful frameworks for developing and implementing successful IPE activities. However, published studies using structured quality improvement approaches for improving clinical educational design are uncommon (Rose et al., 2021; Smith et al., 2021; Wallett et al., 2022). To date we could find none that report on using a quality improvement process combined with a researcher-teacher partnership process (Tanner et al., 2003). To address the need to provide midwifery and medical students in NZ with an effective introductory level IPE activity where they could learn with, from and about each other prior to entering clinical practice (Centre for the Advancement of Interprofessional Education, 2017), a collaborative IPE learning activity (Centre for Interprofessional Education Division of Health Sciences, n.d.) was developed by an interprofessional study team. The IPE learning activity involved first year midwifery students and fifth year medical students from two different tertiary institutions in the same region (University of Otago, Wellington, and University B). Different training years of participating midwifery students and medicine students were selected because both student groups were at similar levels of learning in relation to maternity care, even though the medicine students were in their fifth year (for both groups this was in their first few weeks of learning about maternity care). The study used a quality improvement methodology together with a researcher-teacher partnership approach to develop and improve the IPE learning activity.

In this paper, we describe the practical steps involved in developing the collaborative IPE learning activity; how the use of the quality improvement methodology and researcher-teacher partnership approach was implemented and whether it improved the IPE learning activity developed for pre-registration midwifery and medical students. We outline how the methodology influenced the student's IPE experience, achievement of interprofessional role clarification outcomes and perceptions of the value of IPC and IPE in a maternity context.

Methods

Study design:

This study utilised a quality improvement framework - *Design-Implement-Assess-Modify* (DIAM) (Smith et al., 2021) coupled with a researcher-teacher partnership approach (Tanner et al., 2003) to develop and improve an IPE learning activity. The IPE was delivered twice with separate cohorts of students in April 2022 and August 2022. Table 1 summarises details of the IPE learning activity.

A concurrent triangulation mixed methods evaluation was undertaken to obtain a more comprehensive assessment of each IPE iteration

Table 1:
The IPE learning activity: Setting, design and delivery.

Setting: The first of the two IPE iterations was delivered over Zoom due to Covid-19 disruptions at the time. The Zoom 'breakout room' feature was used for undertaking small group activities. The second (modified) IPE learning activity was delivered in-person in midwifery teaching spaces located within a hospital campus.

Design of the IPE learning activity: Social constructivist learning theory (Hean et al., 2009) informed the design and implementation phases; learning is contextual and occurs through group interaction. The primary learning objective was for midwifery and medicine students to learn about each profession's roles and practice skillsets (role clarification), as well as their unique contributions to maternity care (Authors, 2019). The clinical topic focus for the IPE learning activity was managing human factors in the maternity clinical environment. The IPE learning activity was designed as an interactive session. Four interprofessional teachers facilitated the IPE sessions in two classrooms (one midwife, and one doctor in each room) (Zoom or physical rooms).

Overview of IPE learning activity (1.5-2hrs): The lesson plan for both IPE iterations shared common overall elements: Following accepted Māori tikanga (practices and values) the IPE learning activity commenced with a **1. karakia tāmatanga (opening Māori prayer/incantation) and teacher introductions.** The students were then divided into small interprofessional subgroups to undertake **2. whakawhanaungatanga (introductions and getting to know each other)** (Simmonds et al., 2018). Students were encouraged to talk informally, share background information about themselves, and then reform into classroom groups to more formally ask questions of students from the other profession. After the whakawhanaungatanga, students came back together for a **3. class talk on human factors in the maternity environment**. Finally, students again divided into small interprofessional groups (the same groups used for whakawhanaungatanga) to **4. discuss how to manage two clinical cases** involving applying human factors thinking in maternity settings. After discussing the scenarios, students returned together as a group to **5. Sum up and close with a karakia whakamutunga (closing Māori prayer/incantation).**

Participating students: The student cohorts selected for each iteration participated in the IPE as a course requirement for their respective programs. The different training levels of participating midwifery students (first year) and medicine (fifth year) were selected because both student groups were at similar levels of learning in relation to maternity care despite the medicine students being in their fifth year.[a] The same four teachers (the study team members) participated in both IPE iterations.

[a] first year [Victoria University of Wellington] midwifery students have had some initial experience on clinical placement; fifth year [ictoria University of Wellington] medicine students have experienced clinical placements in other specialty areas, but were at the start of a 5-week block in Obstetrics and Gynaecology and had not taken part as students in giving maternity care.

and the extent to which students' interprofessional learning outcomes were met (Creswell et al 2003; Curry et al., 2013). To undertake this, two different types of data collection were obtained from students post-IPE: a qualitative focus group and a quantitative survey. Ethics approval was granted by the University of Otago Human Ethics Committee ref: D22/057.

The DIAM quality improvement and researcher-teacher partnership approach

The DIAM framework was selected for this study as it has been designed specifically for the development and ongoing improvement of IPE activities through repeated iterations of the four phased cycle – *Design-Implement-Assess-Modify* (see figure 1) (Smith et al., 2021). In this study, two DIAM cycles (and thus two iterations of the IPE learning activity) were undertaken, with assessment of the first IPE iteration informing modifications made to the second IPE iteration.

The partnership between the study team's four IPE teachers and two IPE researchers was initiated when one of the two medical teachers approached the IPE researchers for guidance to develop the IPE learning activity. Prior to this initiative the midwives and doctor teaching the IPE learning activity did not know members of the other profession and had not met, and only one of the four teachers knew one of the researchers. The role of the researchers in the researcher-teacher partnership approach over the course of the DIAM quality improvement cycles is presented in Table 2.

Research recruitment, data collection and participation

Student and teacher participation in the research component of the IPE initiative was voluntary. Participating students completed pre- and post-IPE surveys which used both open questions (free text) and questions that asked students to rate their agreement with a series of statements using a Likert scale of 1 (strongly disagree) to 5 (strongly agree). Separate post-IPE focus groups with students and teachers were also undertaken. The recruitment and data collection process for each IPE iteration are summarised in Figure 2.

Figure 2: Research recruitment and data collection sequence for each IPE iteration (IPE; interprofessional education).

a: The pre-IPE survey included questions about students' programme of study, what they were expecting to learn and their perceptions of the importance of

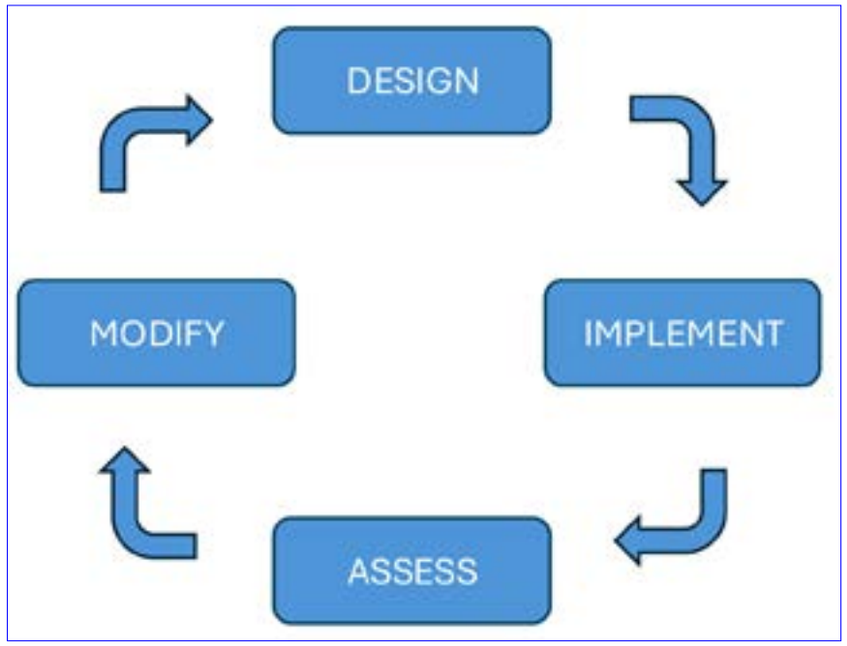

Figure 1: The Design-Implement-Assess-Modify (DIAM) quality improvement

collaboration and interprofessional learning in a maternity context.

[b:] Students were split into two focus groups (the same interprofessional groups used within the IPE learning activity). The first focus group conducted with the first cohort of students (IPE iteration 1) was held online due to Covid-19 disruptions (as was the IPE learning activity), the second focus group post IPE iteration 2 was conducted in-person (as was the IPE session).

[c:] Both post-IPE focus groups with teachers (IPE iterations 1 & 2) were conducted online.Table 3 summarises student participation in the research surveys and focus groups. Prior to taking part in each IPE learning activity, midwifery and medical students were asked to complete pre-IPE surveys. All 25 students in the first IPE iteration and 15/20 (75%) of those in the second IPE iteration completed the pre-IPE surveys. After taking part in the learning activity, 22/25 students (88%) attending the first IPE iteration participated in the focus groups, and 21/25 (84%) completed the post-IPE online survey. For the second IPE iteration, all 20 students attending the IPE stayed on for the focus group and 15/20

Table 2:
The role of the researcher in the researcher-teacher collaboration within the DIAM model cycles (DIAM; Design-Implement-Assess-Modify) (Smith et al., 2021).

Researchers aimed to: 1. model effective interprofessional practice by considering each persons' contributions and ensuring all voices were heard; 2. be mindful that the interprofessional teaching team had only recently formed and could have been sensitive about the results both professionally and interprofessionally; 3. acknowledge that each profession would naturally want their students to 'show well'.	
DESIGN	***First cycle*** • Facilitated meetings with both sets of teachers to plan the learning activity and allow time for the teachers to get to know each other. • Conducted an introductory IPE facilitation training session to promote shared understanding of the IPE objectives as well as to provide facilitation support. • Provided some input into the design of the learning activity. • Designed and obtained feedback from teachers on the initial drafts of the evaluation survey tools and focus group question frameworks. ***Second cycle*** • Provided input into the design of the second learning activity.
IMPLEMENT	***First and second cycle*** • Facilitated student and teacher participation in evaluation data collection immediately following each IPE learning activity.
ASSESS	***First cycle*** • Commended the teaching work achieved. • Acknowledged there may be differences in views and were respectful of both disciplines and all the students. • Presented the teachers with synthesised feedback from the first iteration. ***Second cycle*** • Presented the teachers with synthesised feedback from the second iteration.

Table 2: Continued

Researchers aimed to: 1. model effective interprofessional practice by considering each persons' contributions and ensuring all voices were heard; 2. be mindful that the interprofessional teaching team had only recently formed and could have been sensitive about the results both professionally and interprofessionally; 3. acknowledge that each profession would naturally want their students to 'show well'.	
MODIFY	***First cycle*** • Presented teachers with a 'pick-list' of possible modifications to the IPE, allowing teachers to select changes to the design of the second IPE iteration they felt best addressed each of the issues identified. ***First and second cycle*** • Collaborated closely with teachers to improve the IPE activity whilst acknowledging some aspects must be undertaken separately to safeguard the integrity of the research process (e.g. preserve the anonymity of student survey and student focus group responses).

students (75%) completed the online post-IPE survey. All four teachers participated in both post-IPE focus groups.

Data analysis

Informed by the DIAM framework (Smith et al., 2021), analyses undertaken during the *Assess* phase were iterative, with the analysis of feedback data from the first IPE iteration informing modifications to the second iteration. To analyse the mixed method feedback from each IPE iteration, student surveys and focus group data (from students and teachers) were first analysed independently (Creswell et al., 2003; Curry et al., 2013). Survey data was exported from Qualtrics to Excel and analysed descriptively. Focus group data was transcribed and analysed by one of the researchers (SM) using qualitative content analysis (Kleinheksel et al., 2020). For both IPE iterations, initial content codes identified in transcripts were organised into categories guided by the evaluation questions (i.e., learning outcomes, what worked well and suggested improvements). For the analysis of the

Figure 2: Research recruitment and data collection sequence for each IPE iteration (IPE; interprofessional education).

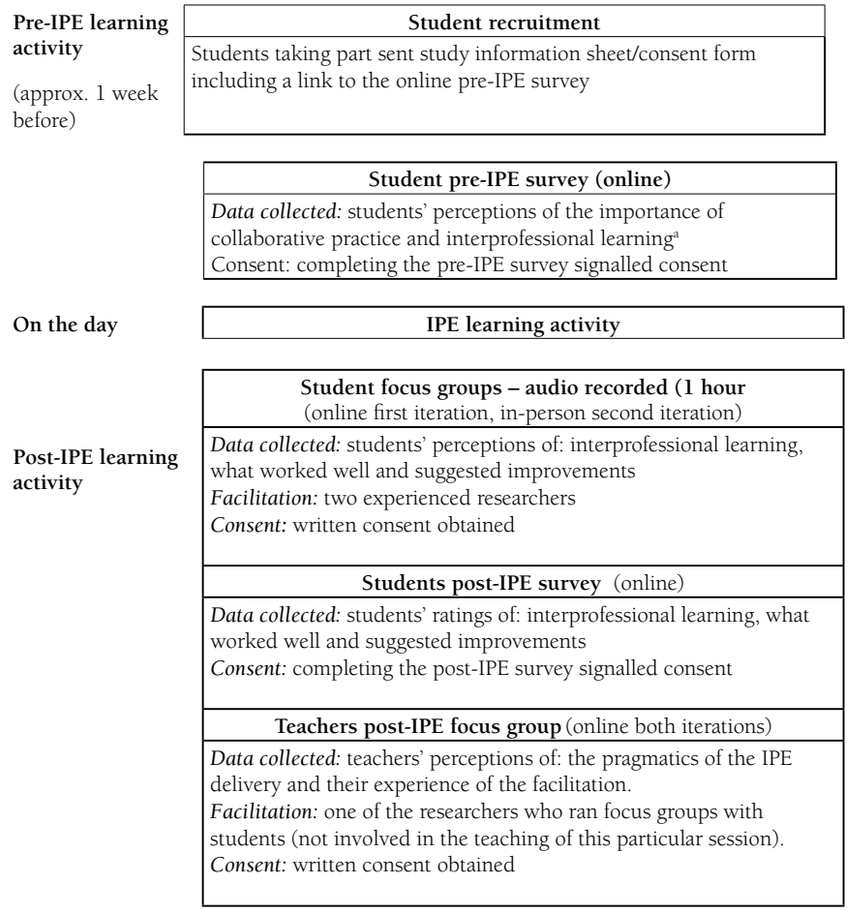

Figure 2: Research recruitment and data collection sequence for each IPE iteration (IPE; interprofessional education).
[a:] The pre-IPE survey included questions about students' programme of study, what they were expecting to learn and their perceptions of the importance of collaboration and interprofessional learning in a maternity context.
[b:] Students were split into two focus groups (the same interprofessional groups used within the IPE learning activity). The first focus group conducted with the first cohort of students (IPE iteration 1) was held online due to Covid-19 disruptions (as was the IPE learning activity), the second focus group post IPE iteration 2 was conducted in-person (as was the IPE session).
[c:] Both post-IPE focus groups with teachers (IPE iterations 1 & 2) were conducted online.

Table 3:
Student participation in surveys and focus groups

	IPE iteration 1			IPE iteration 2		
	Medicine	Midwifery	Total	Medicine	Midwifery	Total
Completed pre-IPE survey	12	14	26 [a] (104%)	6	9	15 (75%)
Completed post-IPE survey	11	10	21 (84%)	7	8	15 (75%)
Completed focus group	11	11	22 (88%)	11	9	20 (100%)
Total number of students attending IPE	11	14	25	11	9	20

[a] one medicine student completed the survey twice.

second IPE iteration, the codes were also grouped according to aspects of the learning activity that had been modified. Consistent with the concurrent mixed methods approach, the analysed survey and focus group data from each IPE iteration was then purposefully synthesised and triangulated by one researcher (SM) and the interpretation reviewed and discussed with the other member of the research team (EM).

Findings

The findings show that the use of the DIAM quality improvement model (Smith et al., 2021) coupled with the collaborative researcher-teacher partnership approach (Tanner et al., 2003) facilitated the development and refinement of the IPE learning activity.

DIAM cycle one: Assessment of the first IPE iteration identified areas for improvement to achieve interprofessional learning outcomes (survey and focus group)

Analysis of the post-IPE survey feedback in the *first Assess* phase revealed participating midwifery and medical students enjoyed the IPE experience

Table 4:
Students' agreement with statements about the learning activity (post-IPE iteration 1 and iteration 2 surveys) (IPE; interprofessional education, IPE 1; IPE iteration 1, IPE 2; IPE iteration 2)[a]

	IPE iteration	Strongly agree	Disagree	Neither	Agree	Strongly agree	Number of responding students
Overall participation: Overall, my participation in the IPE learning activity has been valuable	IPE 1	0 (0%)	2 (10%)	3 (14%)	11 (52%)	5 (24%)	21
	IPE 2	0 (0%)	0 (0%)	0 (0%)	2 (13%)	13 (87%)	15
Learning about the other profession: Participation in the IPE class has increased my knowledge about what the other profession in the IPE class can contribute to the care of pregnant people and their whānau (family).	IPE 1	2 (10%)	8 (38%)	3 (14%)	5 (24%)	3 (14%)	21
	IPE 2	0 (0%)	0 (0%)	0 (0%)	5 (33%)	10 (67%)	15
Learning about own profession: Participation in the IPE class has increased my knowledge about what my own profession can contribute to the care of pregnant people and their whānau	IPE 1	2 (10%)	3 (14%)	7 (33%)	7 (33%)	2 (10%)	21
	IPE 2	0 (0%)	0 (0%)	0 (0%)	5 (33%)	10 (67%)	15
Learning about human factors topic: Human factors/ non-technical skills[b] in the clinical environment was a useful topic for midwifery-medical student IPE	IPE 1	1 (5%)	0 (0%)	3 (14%)	8 (38%)	9 (43%)	21
	IPE 2	0 (0%)	0 (0%)	0 (0%)	6 (38%)	9 (60%)	15

[a] Two different cohort of students participated in iterations 1 and 2. The data in this table is from 25 responding students out of 25 students who attended IPE session 1; and 15 responding students out of 20 students who attended IPE session 2.

[b] The topic of human factors was renamed "non-technical skills" in the second IPE session.

and found the opportunity to meet each other beneficial (see Table 4 *IPE Iteration 1*). Using the 5-point Likert scale 16/21 students (76%) agreed or strongly agreed the IPE learning activity was valuable overall. However, further analysis of other survey questions revealed that although students enjoyed the IPE experience the primary learning outcome of role learning was *not achieved*, with many students reporting that they had learnt little about how their own or the other participating profession contributed to maternity care. For example, 10/21 students (48%) 'disagreed' or 'strongly disagreed' the IPE class increased their knowledge about what the other profession could contribute to the care of pregnant people and their whānau (extended family), and an additional 3/21 students (14%) were neutral. Further, 5/21 (24%) 'disagreed' or 'strongly disagreed' the IPE class increased their knowledge about what their own profession could contribute, and a further 7/21 students (33%) were neutral.

Focus group comments supported the finding that students had learned only a little about each other's roles and contributions to maternity care.

> *'I would want to know a little bit more about how we interconnect with each other, and how we can better each other in our professions.' (Midwifery student, IPE 1 focus group)*

> *'we didn't really learn at all about what midwives really do.' (Medical student, IPE 1 focus group)*

DIAM cycle two: Assessment of the second iteration revealed the modified IPE was well received, and interprofessional learning outcomes achieved (survey and focus group)

In the *Assess* phase following the *first* iteration of IPE, after the mixed method data gathered was analysed (survey and focus groups), teachers met with the researchers to discuss the analysis and consider possible modifications which might be necessary. Teachers then made modifications to the IPE in the *first Modify* DIAM phase and *Implemented* these in the *second* DIAM cycle (see Table 5). Some level of modification was made to each of the seven areas identified for improvement.

Students' and teachers' responses to the *second* (modified) iteration of the IPE synthesised in the final *Assess* DIAM phase revealed the refined learning activity was well received. All modified aspects of the second

Table 5:
Seven aspects of the first IPE iteration identified for quality improvement and modifications made to the second IPE iteration (IPE; interprofessional education)

Aspects of IPE iteration 1 identified for improvement:	**Identified by:**	**Modifications made to IPE iteration 2**
1. The size of the interprofessional subgroups (too large) and insufficient time allocated for whakawhanaungatanga for students to connect and learn about each other's roles.	Students, teachers and researchers	Change a) The size of subgroups for both learning activities was reduced by half and more time was allocated to this component. Change b) The whakawhanaungatanga (introductions and getting to know each other) component was modified to include a more structured question and answer format to improve student interaction. Teachers were provided with a list of 'back-up' questions if students ran out of questions for each other.
2. Misaligned learning levels (the midwifery students had less clinical experience as a whole than the medical students).	Students, teachers and researchers[a]	Change c) Midwifery and medical students were closer aligned in terms of their clinical experience (midwifery students further on in their education programme were selected).
3. The online delivery format.	Teachers	Change d) The IPE learning activity was delivered in-person.
4. The scenario topics used for group work (hand hygiene and racism in maternity care wards) were considered not focused enough on maternity care.	Students and teachers	Change e) The hand hygiene scenario was replaced with a scenario that had more of a maternity focus (administration of Vitamin K to a newborn).
5. The limited input from teachers when discussing the roles of midwives and doctors.	Students	Change f) Teachers were asked to more actively contribute information about midwives' and doctors' roles and fill in any gaps in student knowledge during whakawhanaungatanga and small group case scenario work.

Table 5: Continued

Aspects of IPE iteration 1 identified for improvement:	Identified by:	Modifications made to IPE iteration 2
6. The mix of male students allocated to subgroups – (inadvertently most were in one) these students dominated discussions.	Researchers	Change g) Male students in the second IPE learning activity were distributed evenly between the subgroups.
7. The human factors topic for the IPE (perceived by some students as having been already taught).	Students and researchers	Change h) The topic of human factors was maintained, however it was renamed to "Non-Technical Skills" with the aim of presenting something perceived as new to the medical students (non-technical skills was an unfamiliar term to them).

[a] (students more strongly than teachers)

IPE iteration were reported favourably by students and/or teachers and resulted in students meeting the learning outcomes. All 15 students, 100% of those responding to the post-IPE online survey 'agreed' or 'strongly agreed' their participation in the IPE learning activity had been valuable, with 13 students (87%) indicating strong agreement (see Table 4 *IPE Iteration 2*). In the *second* IPE iteration the primary learning outcome of role learning had been achieved with all students agreeing that the IPE had increased their knowledge of how either the other profession (or their own profession) contributed to maternity care. For example, 15/15 students 'agreed' or 'strongly agreed' the IPE class increased their knowledge about what the other profession could contribute to the care of pregnant people and their whānau, with 10 of these students (67%) indicating 'strong agreement'. All 15 students also 'agreed' or 'strongly agreed' the IPE class increased their knowledge about what their own profession could contribute, with 10 of these students (67%) indicating 'strong agreement'.

Students who attended the refined second iteration of the IPE and participated in the post-IPE focus group and survey elaborated on their enhanced understanding of the importance of IPC in maternity care.

'(I learned) about LMCs (lead maternity carers- midwives) and kind of the continuity of care model ….(and) the importance (of) communication between the two professions and (if) miscommunication happens that can have bad outcomes on maternal care or on the person who is having the baby.' (Medical student, focus group IPE 2)

'there tends to be a bit of a hierarchy with doctors. And then midwives who (say) 'I know everything'… Just knowing that ….if we do have any complications in a pregnancy then you can go to like the obstetrician (and) be able to work together to share the knowledge that we all have, to help that person.' (Midwifery student, focus group IPE 2)

The students also expressed an enhanced understanding of the importance of IPE for midwifery and medical students and a desire for more IPE opportunities as they advanced in their training.

'I found that when I went on my midwifery placement, I had a lot more insight to what the midwife was doing …I am sure that this IPE class helped me feel more at ease and allowed for this interaction to happen.' (Medical student, post IPE 2 survey)

'From what I've seen so far on placement there is quite a bit of disconnect between the midwifery staff and like the medicine staff, so it's good to have these (IPE) sessions where we can start that foundation and then take it through into our practice.' (Midwifery student, post-IPE 2 focus group)

Discussion

This collaborative midwifery and medical IPE initiative is one of the first IPE opportunities developed for midwifery and medical students in NZ. Given this was a new IPE initiative, from the early stages of development all parties (teachers of different clinical practice disciplines and researchers) recognised that changes may be needed after the first delivery and were prepared for this to occur in partnership with each other. We have described the practical steps undertaken to facilitate this collaborative working partnership. We have further demonstrated how using a quality improvement methodology combined with this collaborative researcher-teacher partnership led to an improved activity that was feasible, met the learning outcomes, valued by

students and supported them to develop enhanced interprofessional role clarification skills for future collaborative practice in maternity settings. This highlights the value of using both approaches (quality improvement plus collaborating closely with researchers) when developing IPE learning activities. We believe this approach could have application in workplace and other settings.

Our success employing distinct quality improvement cycles to refine the IPE learning activity aligns with previous studies using cyclic quality improvement designs to improve medical education (Rose et al., 2021; Smith et al., 2021; Wallett et al., 2022). The use of mixed methods of quantitative and qualitative data collection and purposeful integration and triangulation was another key strength of our quality improvement design. Initially the teachers mistakenly concluded the first iteration of the IPE was a success because students reported in the focus group following the first IPE that they had enjoyed taking part. If the post-IPE survey data had not been obtained, we would not have known *how little* the students had learned about each other's roles in practice. Conversely, without the student focus group data, aspects of the initial IPE identified by researchers for improvement in the subsequent iteration (i.e., the unhelpful dynamic relating to male students) would have been missed. The integration of the multiple, mixed method feedback data sources gathered during the first quality improvement cycle led to the identification and modification of seven different aspects of the IPE learning activity, all of which were then reported favourably by students and/or teachers participating in the refined IPE iteration (and which as a whole led to students reporting their improved learning about role clarification). However, the quality improvement methodology on its own may not have been enough to achieve these results without the involvement of researchers and the collaborative researcher-teacher partnership underpinning our research. The profession-specific skills the researchers brought to the clinical teaching team (e.g., designing data collection instruments/processes, synthesising the quantitative and qualitative data sets from multiple perspectives; IPE teacher experience) provided an independent, practical, and more rigorous approach to the quality improvement analysis; and this is shown in the wide-ranging modifications suggestions in Table 5. The researchers also played a key role in facilitating right from the start of the project the development of effective working relationships between the midwifery and medical members of the interprofessional teaching team given the

teachers were from different disciplines and previously unknown to each other.

The importance of interprofessional teaching teams actively embracing and modelling interprofessional competencies themselves is well known (Silver and Leslie, 2009; Watkins, 2016; Smith et al., 2021), however this study shows these interprofessional collaborative practices are also beneficial for effective researcher-teacher partnerships. Bevins and Price (2014) conceptualised researcher-teacher working relationships as either *client-supplier, coercive or collaborative*. The close working relationship and equal partnership established between teachers and researchers from different professional cultures in our study were akin to Bevin's mutually beneficial '*collaborative relationship*'. The teachers accepted and trusted the researchers' analysis and interpretation of the students' feedback data related to the first IPE iteration (which portrayed more negative experiences of the IPE than the teachers felt themselves). If the teachers had not accepted the researchers' findings, they may not have been willing to make the necessary modifications to the design of the subsequent learning activity. If the researchers had not conveyed their feedback sensitively to the teachers, they may have not gained this trust.

The conditions for this close researcher-teacher partnership in our study was prompted by the teachers reaching out to the researchers for assistance/guidance. Moreover, from the outset the collaborative relationship was facilitated by a shared commitment to provide midwifery and medical students with an effective IPE opportunity and the considerable shared 'common ground' between researcher and teacher team members, even though they were from different professional cultures (Tanner et al., 2003). Although the two researchers were not midwives or doctors, they both had topic-specific knowledge as IPE researchers and one as a previous IPE teacher had relevant cross-institutional knowledge and experience. The solid partnership established was further reinforced and maintained through intentional efforts on both sides to facilitate successful working relationships. This included bringing all parties together to seek each other's advice and build relationships, through regular communication, sensitive delivery of feedback, being open, and using interprofessional collaborative strategies that respected the different professional skills, experiences, and different perspectives of each group (in particular, the researchers need to maintain confidentiality boundaries with data).

Although we are not aware of any previous work published describing the use of researcher-teacher partnership approaches to develop and refine

IPE activities, the potential benefits of collaborative partnerships between researchers and teachers in wider educational and workplace contexts have been highlighted (Tanner, 2000; Bevins & Price, 2014; Goos, 2014; Leeman et al., 2018). Similar to our research, authors of these publications report key factors to facilitating effective collaborative relationships between researchers and teachers in both workplace and educational settings include: establishing and affirming the common ground shared such as shared motivations/purpose (Tanner, 2000; Tanner et al., 2003; Goos, 2014) mutual trust and respect and a mutual responsibility for the research (Leeman et al., 2018).

Limitations of this study include the small sample size and the different cohorts of students participating in the two IPE iterations. We cannot say for certain whether the improvement in learning outcomes reported with the second IPE iteration were exclusively due to the modifications made to the IPE, or whether other characteristics of the second cohort (who were 6 months further on in their training) also played a part. However, analysis of the pre-IPE survey data suggested the second student cohort were no different from the first in relation to attitudes held towards interprofessional learning or collaborative practice. Students in our study were positive about the midwifery-medical IPE before taking part in the IPE learning activity. Similarly, the teachers from both institutions were also positive and engaged in making the process of the IPE work. The results may have been different with less motivated groups of students and/or teachers. The research took place during the Covid-19 pandemic when significant disruptions to student learning and teaching had occurred.

Conclusion

This study demonstrates the benefits of using a quality improvement methodology coupled with a researcher-teacher partnership to develop an effective IPE activity for midwifery and medical students. The collaborative partnership led to students achieving the desired learning outcomes and they enjoyed taking part in the learning activity. It also cemented the teachers' desire to deliver further iterations of this IPE and to explore further IPE learning activities (both have occurred).

Further research would be needed to examine whether students' learning from this IPE experience impacted their future collaborative practice. However, our findings considered in in the context of the wider research

base lead us to suggest the development of interprofessional competencies, particularly role clarification and appreciation between midwifery and medical students in their undergraduate years has the potential to improve future collaborative working relationships as graduates (Baecher-Lind et al., 2022).

These findings add to the small but growing body of literature on IPE curriculum design improvement methods, and we believe these could be applied to workplace-based education. While the benefits of quality improvement methodologies for medical education design have been identified before, the additional value of augmenting this approach through a close researcher-teacher partnership model is new. Future research is needed to explore when the DIAM researcher-teacher partnership model should be chosen as it is time intensive and should potentially be preserved for interprofessional learning activities where there is limited evidence to guide the development of the IPE. In addition, it is important to identify which elements of the researcher-teacher partnership are most important from a teacher and researcher perspective and how these can be embedded in the model.

Acknowledgements

We would like to acknowledge and thank the midwifery and medical students who participated in this research. We would also like to acknowledge and thank Dr Tehmina Gladman, Education Advisor University of Otago, for her assistance with facilitating the student focus groups.

Declarations of interest:

None.

Ethical statement

Ethics approval for this study was granted by the University of Otago Human Ethics Committee ref: D22/057.

Funding

This work was supported by the University of Otago Committee for the Advancement of Learning and Teaching Grant.

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