INTERPROFESSIONAL EDUCATION

Recommendations for the design of interprofessional education: Findings from a narrative scoping review

R. Shakhovskoy[1, 2, 3, *], N. Dodd[2, 3, 4, *], N. Masters[5], K. New[5, 6], A. L. Hamilton[5], G. Nash[7], N. Barr[2], K. George[2], F. Pelly[5], C. Reid[2], J. Taylor[5] & F. Bogossian[2, 4, 5]

Abstract

Introduction: Evidence-based teaching and learning strategies should underpin any educational activity. This is particularly important for interprofessional education (IPE) activities, where there is an expectation that healthcare professions are taught using best available evidence. There is a research–practice gap that this review aims to address by using the current evidence to develop recommendations regarding optimal design components to better inform faculty who design IPE.

Methods: A five-stage scoping review was conducted. Methodological characteristics and IPE design components of primary and review studies were extracted. Three important components of design—participants (level and stage of progression, discipline type and number, group size and ratios), learning constructs (theories, frameworks, learning objectives) and learning approaches (exchange, observation, action, simulation and practice)—were reviewed to develop recommendations regarding effective design.

Results: A total of 41 papers were eligible for inclusion, 24 primary and 17 review studies. The primary studies were predominantly descriptive case studies with 31 disciplines involved in IPE activities across the studies. There was inconsistent reporting of learning constructs utilised in design, and the most reported learning approach was exchange. There was significant variability in the aims and design of the 17 review studies, ranging from systematic reviews to realist reviews, with the number of included studies ranging from six to 104.

[1] Sunshine Coast Hospital and Health Service, Birtinya, Australia
[2] School of Nursing, Midwifery and Paramedicine, University of the Sunshine Coast, Sippy Downs, Australia
[3] School of Medicine and Dentistry, Griffith University, Sunshine Coast, Birtinya, Australia
[4] Sunshine Coast Health Institute, Birtinya, Australia
[5] School of Health and Behavioural Sciences, University of the Sunshine Coast, Sippy Downs, Australia
[6] Consultant, Healthcare Evidence and Research, Brisbane, Australia
[7] School of Education and Tertiary Access, University of the Sunshine Coast, Sippy Downs, Australia
* co-lead authors

Correspondence

Dr Natalie Dodd
ndodd1@usc.edu.au

Conclusions: There was a lack of detailed reporting regarding design components, which limits the evidence base to inform IPE design. Reported components from the primary studies were augmented by findings from the review studies and the wider literature, which enabled the development of recommendations to assist faculty in the design of IPE programs and activities.

Keywords: interprofessional; interprofessional education; interprofessional collaboration; education design; health professions

Introduction

Health professionals need to learn together to develop the competencies required to work together in their professional roles. Interprofessional education (IPE) enables students and health professions to learn "with, from and about each other to improve collaboration and the quality of care" (Barr, 2002, p. 6). IPE has the potential to create a collaborative, practice-ready health workforce that can improve the quality and safety of care in health systems. Achieving this aim requires those who develop IPE programs and activities to have specific knowledge and skills in IPE design. Design is central to how learners are educated and engaged and supports them to construct meaning from their experiences. Effective design of IPE activities and programs can create purposeful, deliberate and systematic activities that underpin learning and promote the transfer of knowledge and skills from theory to interprofessional collaborative practice (IPCP).

Despite a recognised need for faculty development to support delivery of IPE, faculty report feeling ill-equipped to do so (Hall & Zierler, 2015). A significant focus of the literature has been on creating curriculum models with appropriate learning contexts, teacher and learner characteristics, approaches to learning and teaching, and the attainment of collaborative competencies (Freeth & Reeves, 2004; Thistlethwaite, 2012; Thistlethwaite et al., 2014). Many early IPE exponents have used a pragmatic approach (Barr, 2013), resulting in considerable diversity across design components of IPE. Underpinning IPE with theoretical frameworks has been identified as an important factor in design (Danielson & Willgerodt, 2018). Several theories have been proposed to inform IPE design, including contact theory and activity theory, which includes social identity and complexity theory (Hean et al., 2012; Owen, 2014), as these align with common principles found in IPE frameworks, such as the Canadian Interprofessional Healthcare Collaboration (CIHC) (2010) and Interprofessional Education Collaborative (IPEC) (2016). There is an identified need for improved reporting of the underpinning theoretical framework of IPE programs and activities (Owen, 2014), suggesting that this important design component may not be a routine part of IPE activities.

This paper focuses on IPE design, which we operationally defined as all components required to design a curriculum, course or activity, including determining the needs of learners by understanding their level, stage of progression and discipline; defining learning constructs; and developing the approach to teaching and learning activities,

to ensure the quality of the instructional design. Three components were identified (participants, learning constructs and learning approaches) and literature synthesised to develop recommendations regarding optimal IPE design approaches. This study aimed to summarise the evidence for effective design of IPE and synthesise recommendations to assist faculty in the design components of IPE programs and activities.

Methods

This review is one of a set of reviews to summarise evidence and to synthesise recommendations to assist faculty involved in the design, implementation (Bogossian et al., 2022), assessment and evaluation of IPE programs and activities. A preliminary review of the literature revealed limited evidence to inform design of IPE. Consequently, in order to inform recommendations, we undertook a scoping review using the five stages outlined by Arksey and O'Malley (2005) and informed by Levac et al. (2010): 1) identify the research question, 2) identify relevant studies, 3) select studies, 4) chart the data and 5) collate, summarise and report the results.

Step 1: Identify the research question

The research questions for this scoping review were: 1) What are the characteristics and design components reported in primary studies of IPE? 2) What are the recommendations from primary and review studies to inform faculty designing IPE programs and activities?

Step 2: Identify relevant studies

A senior librarian (RC) developed the search strategy in consultation with the project team. The inclusion criteria were peer-reviewed original research and reviews, regardless of methodological approach, reporting on IPE design, implementation, assessment and/or evaluation—restricted to pre-specified health professional groups, tertiary students and post-licensure professionals—that involved two or more disciplines from a list of 25 regulated and self-regulated discipline groups in Australia. Disciplines identified by the project team were Chinese medicine, chiropractic, counselling, dietetics, dentistry, exercise physiology, Indigenous or First Nations' health, medical imaging, medicine, midwifery, nursing, nutrition, occupational therapy, optometry, osteopathy, paramedicine, pastoral care, pharmacy, physiotherapy, podiatry, psychology, public health, physician assistant, social work and speech pathology. Theses and grey literature were excluded.

Preliminary searching was undertaken by RC in May 2019 on Scopus and CINAHL (EBSCOHost) using title, keyword and abstract, with filters limiting to human studies, in English language and those published between 2010 and 2019. This yielded approximately 3,000 references, so the search strategy was refined and search terms narrowed to interprofessional education, interprofessional collaboration, interprofessional practice and health. Subsequently, ERIC (Education Resources Information Center), PsycInfo and the Cochrane Library databases were included in the search strategy.

Step 3: Select studies

Search results were collated into Endnote X7 (2013) and obvious duplicates removed by RC. Initial screening to check for animal studies and any remaining duplicates was undertaken by one team member (KN). Screening by title and abstract was then undertaken by two team members (KN and FB) based on the inclusion criteria. Full text papers were retrieved and divided between six pairs of team members (NB–KG, AH–NM, GN–JT, FP–RS, CR–ND, FB–KN), who assessed eligibility and undertook preliminary data extraction. Disagreement or uncertainty between paired team members was arbitrated by one of two team members (KN or FB). Included papers were collated by KN into each of the four a priori IPE domains (design, implementation, assessment and evaluation). The focus of this review was to identify papers that related to design. Results of the other domains will be reported elsewhere. Papers were not excluded based on methodological quality.

Step 4: Chart the data

Members of the design domain team (NM, RS, ND, KN) systematically confirmed preliminary extracted data, clarified and extracted additional design-related data as needed, confirmed eligibility and checked reference lists for papers not identified in the initial search. The team charted data from original research studies, including study design and methods, study aims or research questions and design components (participants, learning constructs and learning approaches). Drawing on the teaching and learning decision-making tree (Owen, 2014), participant data was charted in respect to level and stage of progression, discipline type and number, and group size and ratios. Learning constructs were defined as the foundation elements in creating IPE, including theories, frameworks and objectives. Objectives were mapped to the professional competency domains within the CIHC (2019) framework: role clarification, conflict resolution, team functioning, collaborative leadership, communication and patient safety. Learning approaches adapted from Barr (1996) have been classified as exchange, observation, action, simulation and practice (Owen, 2014). Data charted from review studies included review design, aims and/or research questions, number of primary studies within each review and type of analysis or synthesis.

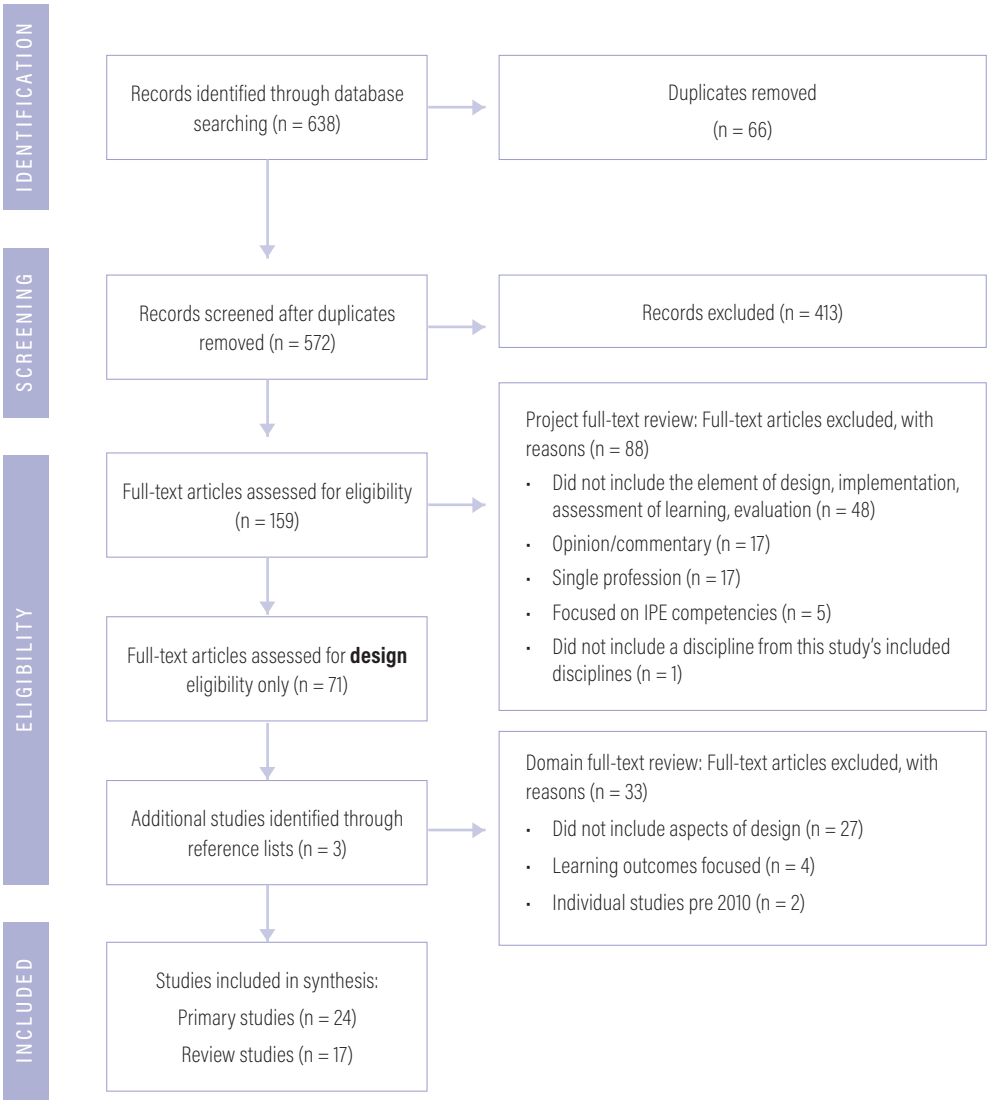
Step 5: Collate, summarise and report the results

Once data were extracted from each of the papers, the approach to study methodology was similar to that undertaken by Reeves and colleagues (2011). Methodological rigour and findings were not examined; rather, primary studies were classified by study design using a simple typology, including descriptive (case reports, cross-sectional, etc.) and analytical (observational—cohort, cross-sectional, case-control—or experimental) (Ranganathan & Aggarwal, 2018) and then scrutinised for characteristics and design

components. Review study designs were classified according to the "typology of reviews" proposed by M. Grant and Booth (2009). Recommendations relating to the design of programs and activities that were either explicitly stated, or could be inferred, were extracted from the studies.

Figure 1

Flow Diagram for Paper Selection Process for the Design Domain



Results

The search resulted in 574 papers being identified after removal of duplicates. Of these, a total of 159 papers were assessed for eligibility based on one or more of the four IPE domains (design, implementation, assessment, evaluation). Seventy-one papers were screened for inclusion, and three additional papers were identified from handsearching the reference lists. A total of 41 papers were eligible to include in the synthesis of components of design (Figure 1), comprising 24 primary and 17 review studies.

Characteristics of included studies

The characteristics of the 24 primary studies are presented in Table 1. Primary studies were undertaken in the United States of America (USA) (n = 14), Canada (n = 5) and one study each in the United Kingdom (UK), Ireland, Belgium, Australia and across Australia and New Zealand. The majority of included primary studies were descriptive in design and classified as case reports (n = 17), cross-sectional (n = 3), mixed method (n = 2), pilot (n = 1) and a cohort study (n = 1).

Included studies reported directly on the design components of IPE programs or activities directed at health professional learners. Twenty of the 24 primary studies reported on single IPE activities. One primary study (Evans et al., 2011) reported on 14 IPE activities with differing design components for each of the activities. A cross-sectional survey study (Lapkin et al., 2012) reported multiple IPE programs and activities across Australia and New Zealand. L. Grant et al. (2011) reported on two discrete IPE activities designed to provide collaboration for students of dental hygiene and nursing. VanKuiken et al. (2016) described the challenges inherent in development of both faculty and an IPE program in a university without a medical centre with five separative activities outlined.

The characteristics of the 17 review studies are outlined in Table 2. The aims or research questions of these papers containing design components varied substantially from reviewing underlying teaching methods in IPE (Fox et al., 2018) to focusing on specific competencies addressed through a single learning approach (Granheim et al., 2018). Systematic review (n = 4) was the most common review design, with various other designs including literature reviews (n = 3), scoping reviews (n = 3), critical reviews (n = 2), a systematic literature review and a literature overview. Most of the reported review designs aligned with the typology of reviews we used (M. Grant & Booth, 2009), however three reviews were outside this characterisation, namely integrative reviews (n = 2) and a realist review (n = 1). The number of studies included in the papers varied from six in small systematic reviews to 104 in a large scoping review. The analysis/synthesis of the included studies was predominantly qualitative (n = 11), with two papers using quantitative analyses, one a meta-analysis, one a systematic analysis and two syntheses.

Table 1

Characteristics of Included Primary Studies

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Acquavita et al. (2014), USA	To explore students' attitudes, knowledge, experience and receptiveness to IPE in the health sciences	Mixed methods (Readiness for Interprofessional Learning Scale (RIPLS) questionnaire and semi-structured interviews)	*Level*	Undergraduate law students, graduate health sciences students	Nil	Nil	Practice	Placement
			Stage of progression	Not detailed				
			Discipline type	Medicine, nursing, pharmacy, social work, law				
			Discipline number	5				
			Total number	29				
			Number per group	Not detailed				
Cusack & O'Donoghue (2012), Ireland	To examine health science students' perceptions of an IPE module delivered by means of problem-based learning (PBL)	Cross sectional (Questionnaire to evaluate an IPE PBL module)	*Level*	Undergraduate	Nil	Role clarification, team functioning, communication	Action	Problem-based learning
			Stage of progression	Not detailed				
			Discipline type	Medicine, nursing, physiotherapy, diagnostic imaging				
			Discipline number	4				
			Total number	92				
			Number per group	8–10				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Dando et al. (2012), UK	To report the evaluation of an interprofessional practice placement experience in palliative care from a student perspective	Mixed methods (Triangulation of student, patient and mentor evaluations)	*Level*	Undergraduate	Nil	Role clarification	Exchange	Case discussion
			Stage of progression	Final-year students				
			Discipline type	Medicine, nursing, physiotherapy, occupational therapy				
			Discipline number	4			Practice	Placement and work-related assignment
			Total number	59				
			Number per group	12				
Dean et al. (2014), Canada	To describe the elements and enablers for IPE clinical placements in diabetes teams	Case report (Development of an IPE clinical placement and share lessons learned)	*Level*	Undergraduate and postgraduate	F: CanMEDS physician competency framework; F: CIHC IPE competency framework	Role clarification	Exchange	Debate, case discussion
			Stage of progression	Varied: dietitians, 1st year postgraduate; pharmacists, undergraduate and postgraduate year 1; medicine, postgraduate/undergraduate				
			Discipline type	Medical, nursing, pharmacology, speech therapy, dentistry, dietetics			Action	Case and problem-based learning
			Discipline number	3 disciplines per group, 6 disciplines in total				
			Total number	101			Practice	Placements, work related assignments
			Number per group	3				

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Deutschlander et al. (2012), Canada	To discuss the strategies and challenges of implementing IPE interventions with students from different disciplines	Case report (Reported analysis of an interprofessional pilot intervention as an alternative approach to the extracurricular model and crossbar model for ease of implementation, program reach and sustainability)	*Level*	Undergraduate	Nil	Role clarification, communication	Exchange	Workshops, online case discussions
			Stage of progression	4th year				
			Discipline type	Medicine, nursing (26 students), pharmacy, speech therapy, physiotherapists, occupational therapists, respiratory therapists			Observation	Shadowing
			Discipline number	7				
			Total number	34			Practice	Placement with interprofessional mentoring
			Number per group	Not detailed, noting numerous different learning opportunities				
Di Prospero & Bhimji-Hewitt (2011), Canada	To present the faculty's perspectives with facilitated teaching of a first-year interprofessional course within the didactic curriculum of a health professional program	Cohort study (Content analysis of debrief sessions held weekly with facilitators teaching an IPE course)	*Level*	Undergraduate	Nil	Team functioning, communication	Exchange	Plenary discussions, reflective discussions
			Stage of progression	First year				
			Discipline type	Medical laboratory sciences, ultrasound, medical radiation sciences (nuclear medicine, radiological technology and radiation therapy), chiropody and cardiovascular perfusion (CVP)			Action	Collaborative enquiry, case-based teaching
			Discipline number	7			Simulation	Skills practice, experiential activities
			Total number	250				
			Number per group	Variable depending on activity, minimum of 4 out of 7 professionals in small-group work				

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Djukic et al. (2012), USA	To describe the New York University (NYU) NYU3T: Teaching Technology, Teamwork model, which uses novel technologies to drive implementation of evidence-based teamwork and collaboration curricula	Case report (Described the curricular components, implementation strategy, evaluation methods and lessons learned)	*Level*	Undergraduate/postgraduate	Nil	Role clarification, conflict resolution, team functioning, collaborative leadership, communication	Exchange	Seminars, discussion
			Stage of progression	Medicine: 2nd-year undergraduate; nursing: 1st semester of 2nd degree			Observation	Shadowing
			Discipline type	Medicine, nursing				
			Discipline number	2			Simulation	Experiential, standardised patients
			Total number	328			Practice	Virtual patient care assignments
			Number per group	Variable, depending on learning activity				
Evans et al. (2011), USA	To provide a summary overview of team initiatives, lessons learned, key factors for success and challenges encountered	Case report (Described the goals of the Institute for Interprofessional Prevention Education, team educational initiatives and short- and long-term outcomes/impacts; 14 initiatives described)	*Level*	Undergraduate	Nil	Role clarification, team functioning, patient-centred care/safety	Exchange	Multiple initiatives
			Stage of progression	Not described				
			Discipline type	Varied across projects described, included: allied health, behavioural health, business, clinical laboratory sciences, dentistry, genetics, health administration, law, medicine, nursing, nutrition, occupational therapy, pastoral clergy, pharmacy, physical therapy, physician assistant, psychology, public health, social work			Simulation	Multiple initiatives
			Discipline number	Range from 3–6				
			Total number	Range from 4–300			Practice	Multiple initiatives
			Number per group	Range from 4–300				

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Galbraith et al. (2014), USA	To describe the development, implementation and evaluation of an interprofessional death notification simulation into curriculum	Case report (Described the development and implementation of a simulation for death notification. A survey and a debriefing session were used to evaluate the simulation experience.)	*Level*	Undergraduate	T: Conceptual framework—theory of self-efficacy	Nil	Simulation	Standardised patients
			Stage of progression	Senior level				
			Discipline type	Nursing, social work				
			Discipline number	2				
			Total number	36				
			Number per group	4 active participants with 32 active observers				
Grant et al. (2011), Canada	To develop two interprofessional learning components (to provide partnership and collaboration to enhance the outcomes of 1) improved oral assessment and daily oral care and 2) improved practice of taking a manual blood pressure and pulse)	Case report (Described the development, integration into the IPE curriculum and student evaluation of an IPE initiative)	*Level*	Undergraduate	Nil	Role clarification, team functioning, patient-centred care/safety	Simulation	Clinical-skills centre
			Stage of progression	1st–3rd year				
			Discipline type	Nursing, dentistry				
			Discipline number	2				
			Total number	Initiative 1: 208 Initiative 2: 23				
			Number per group	Initiative 1: 208 (8 dentistry, 200 nursing); Initiative 2: 23 (8 dentistry, 15 nursing)				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Kaplan et al. (2015), USA	To describe 1) the process of including advanced nurse/midwifery students into 2 classes previously offered solely to medical students, 2) the development of the courses, obstacles, feedback and responses to course evaluations	Case report (Described the development of two interprofessional courses and course evaluation)	*Level*	Undergraduate midwifery, postgraduate medicine	Nil	Team functioning, collaborative leadership, communication, patient-centred care/safety	Exchange	Seminar, case discussion
			Stage of progression	First-year medicine, first-year midwifery				
			Discipline type	Medicine, midwifery				
			Discipline number	2			Action	Collaborative enquiry, problem-based learning
			Total number	163				
			Number per group	13 (Ratio: 1 midwifery to 12 medicine)				
Krystallidou et al. (2018), Belgium	To describe the design and implementation of the joint training intervention and present results of its evaluation, focusing on the findings pertaining to the student interpreters' evaluation of the intervention	Case report (Described the design, implementation and evaluation of a joint training intervention; questionnaires and a debriefing session used)	*Level*	Postgraduate interpreter, undergraduate medicine	F: Calgary-Cambridge communication skills	Communication	Exchange	Plenary lecture
			Stage of progression	Masters level interpreter, 3rd–4th year medicine				
			Discipline type	Medicine, interpreter				
			Discipline number	2			Simulation	Standardised role play
			Total number	529				
			Number per group	10				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Lapkin, et al. (2012), Australia and New Zealand	To scope the extent to which IPE is currently used 1) in Australian and New Zealand nursing, pharmacy and medical programs, 2) to teach medication safety and 3) to identify barriers and facilitators to curriculum integration of IPE	Cross-sectional (Web-based survey consisting of 43 questions—7 demographic, 16 IPE, 13 IPE and medication safety and 7 barrier and facilitator questions. Target population was heads of nursing, pharmacy or medical schools in Australian and New Zealand universities)	*Level*	Mixed	Nil	Nil	Exchange	Multiple initiatives
			Stage of progression	Not detailed				
			Discipline type	Medicine, nursing, pharmacy, physical therapy, respiratory therapy, occupational therapy, dentistry, paramedic			Action	Multiple initiatives
			Discipline number	Average 3–6 disciplines			Simulation	Multiple initiatives
			Total number	Not detailed				
			Number per group	Not detailed			Practice	Multiple initiatives
Masters et al. (2013), USA	To describe the curricular design that outlines the groundwork and strategies required to implement stimulated team-based learning activities	Case report (Described The Simulated Interdisciplinary to Multidisciplinary Progressive-Level Education (SIMPLE) approach and integration into health professional programs)	*Level*	Undergraduate	Nil	Role clarification, team functioning, communication	Exchange	Seminar, case discussion
			Stage of progression	Undergraduate through to end of degree				
			Discipline type	Nursing, physician assistant, respiratory care, physiotherapy, occupational therapy, sport sciences, radiologic science			Action	Case-based teaching
			Discipline number	7 in total (3 comprehensively studied)			Simulation	Clinical-skills teaching, role play, standardised patients
			Total number	Not detailed				
			Number per group	Not detailed				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Mendel et al. (2015), USA	To determine the impact of an isolated interprofessional podiatric surgical simulation between nurse anaesthetists and podiatric medical students	Pilot study (Interdisciplinary Education Perception Scale tool to assess interprofessional attitudes; the tool was administered pre and immediately post the 2-hour simulation activity)	*Level*	Postgraduate nurses, Undergraduate podiatrists	Nil		Action	Problem-based learning
			Stage of progression	Second-year podiatry students				
			Discipline type	Nursing, podiatry				
			Discipline number	2			Simulation	Clinical-skills centre
			Total number	26				
			Number per group	Not detailed				
Neville et al. (2013), Australia	To develop a program of IPE focusing on team decision making	Cross-sectional (Medicine, midwifery and nursing second-year students completed the RIPLS and the generic and nurse versions of the Role Perception Questionnaire prior to IPE activities)	*Level*	Undergraduate	Nil	Role clarification, team functioning	Exchange	Case discussion
			Stage of progression	Second-year students				
			Discipline type	Medicine, nursing, midwifery				
			Discipline number	3				
			Total number	61				
			Number per group	8				

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Packard et al. (2018), USA	To describe the lessons and challenges learned in designing and implementing the IPE Passport to meet diverse IPE needs	Case report (Staff members put forward IPE activities that had to meet rubric evaluation criteria—process and content—and be approved by an IPE curriculum committee)	*Level*	Undergraduate and postgraduate nursing, other undergraduate	F: IPEC	Role clarification, conflict resolution, team functioning, communication, patient-centered care/safety	Exchange	Introductory online IPE course
			Stage of progression	Not detailed				
			Discipline type	Dentistry, emergency medical services, medicine, nursing, occupational therapy, pharmacy, physical therapy				
							Other	Note: other approach modalities utilised for IPE Passport activities not detailed
			Discipline number	7				
			Total number	Not described				
			Number per group	Not described				
Reis et al. (2015), USA	To describe the delivery of web-based IPE for nurse–midwifery and third-year medical students utilising a virtual community clinic learning environment	Case report with pre-and post-test (Described a virtual community clinic learning environment using avatars and virtual patients to deliver interprofessional team-based activities)	*Level*	Undergraduate	F: IPEC	Role clarification, collaborative leadership, communication, patient-centred care/safety	Action	Asynchronous web-based problem-based learning
			Stage of progression	3rd-year medical students				
			Discipline type	Medicine, midwifery				
			Discipline number	2				
			Total number	25				
			Number per group	25				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Shaw-Battista et al. (2015), USA	To develop new simulation-based learning modules to enhance pre-existing courses focused on midwifery management of normal birth and intrapartum complications and to incorporate learners from other professions	Case report (Described childbirth simulation design and implementation within a nurse–midwifery education program)	*Level*	Undergraduate midwifery, postgraduate nursing, post-licensure doctors, undergraduate doctors	Nil	Team functioning, communication	Simulation	Standardised patients, skill centre
			Stage of progression	Variable; first- and second-year midwifery students				
			Discipline type	Medicine, nursing–midwifery				
			Discipline number	2				
			Total number	Not detailed				
			Number per group	Not detailed				
Tartavoulle et al. (2016), USA	To increase opportunities for IPE for learners by introducing an IPE elective	Case report with pre-and post-test (Described the use of the IDEA framework to design learning activities and assessed competency related to roles and responsibilities using the RIPLS administered pre and post the course)	*Level*	Undergraduate	F: IPEC, IDEA	Role clarification, communication	Exchange	Case discussion
			Stage of progression	Early to mid-professional training				
			Discipline type	Medicine, nursing, pharmacy, dentistry, public health, graduate studies, allied health				
			Discipline number	7 schools: specific disciplines not detailed			Simulation	Experiential group work
			Total number	137				
			Number per group	10 for exchange-based approaches (from 6 different professions)			Practice	Work-related interview assignment

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
Topping (2015), USA	To determine the longer-term perceived effects of a short course in the Russian language and culture in an interprofessional healthcare setting on the attitudes and experiences of the participants	Case report (Online survey of medical, nursing and pharmacy students, one year post an interprofessional course in Russian language and culture)	*Level*	Undergraduate	Nil	Communication, patient-centred care/safety	Exchange	Seminar
			Stage of progression	Not detailed				
			Discipline type	Medicine, nursing, pharmacy				
			Discipline number	3			Action	Joint project
			Total number	17				
			Number per group	2–3				
Vanderzalm et al. (2013), Canada	The development and implementation of an interprofessional clinical learning unit to enhance IP clinical education and improve patient care in a rehabilitation setting	Case report with pre-and post-test (Surveys and focus groups to identify areas for improvement analysed using qualitative methods; a working group developed and implemented initiatives to enhance IP practice)	*Level*	Undergraduate and postgraduate	Nil	Role clarification, communication	Exchange	Case discussion, problem solving
			Stage of progression	Not detailed			Observation	Shadowing
			Discipline type	Nursing, medicine, OT, physical therapy, speech therapy, recreation therapy, social work, nutrition, clinical psychology, audiology, dentistry			Action	Case-based teaching
			Discipline number	11			Simulation	Role play
			Total number	19			Practice	Placement, work-related assignment
			Number per group	19				

ISSN 1442-1100

Author/Year/ Country	Study Aim/s	Study Design (Methods)	Participants		Learning Constructs		Approaches	
					Theories (T) Frameworks (F)	Objectives (Competency Domains)	Classification	Method
VanKuiken et al. (2016), USA	To highlight how a private university without an affiliated medical centre created a multifaceted IPE program that engages students from a variety of disciplines and experience levels	Case report (Described the development of faculty and an IPE program built around desired learning outcomes of increasing knowledge, developing positive attitudes and building skills)	*Level*	Undergraduate and postgraduate	Nil	Role clarification, team functioning, communication	Exchange	Seminars, case discussions
			Stage of progression	Variable for each of 5 described IPE initiatives				
			Discipline type	Athletic training, clinical mental health counselling, health services administration, nursing, OT, psychology, radiologic technology, social work, special education			Observation	Joint visits
							Action	Problem-based learning
			Discipline number	9			Simulation	Role play, standardised patient
			Total number	Variable number in each initiative			Practice	Work-related assignment
Watts et al. (2014), USA	To describe a team-based simulation experience involving multiple patient scenarios running simultaneously to prepare students from multiple healthcare professions to work together to enhance the delivery of effective high-quality care and to decrease the potential for error in practice	Case report (Described process and simulation scenarios and set up)	*Level*	Undergraduate except for medicine (post-licensure)	F: IPEC	Team functioning, communication	Simulation	Clinical-skills centre, standardised patients, role play
			Stage of progression	Resident doctors, other students				
			Discipline type	Medicine, nursing, respiratory therapy, clinical laboratory science				
			Discipline number	4				
			Total number	16				
			Number per group	16				

Table 2

Characteristics of Included Review Studies

Author (Year)	Aims/Research Questions	Review Design	Number of Primary Studies Within Review	Analysis/ Synthesis
Curran et al. (2015)	To review the evaluation outcomes of IPE initiatives delivered using information and communication technologies	Literature review	55	Systematic analysis
Fox et.al. (2018)	What teaching methods are most effective when engaging health professional students in teamwork-specific IPE activities? How are these activities assessed? What variables influence the success of these activities (i.e., context, professional mix, length of intervention)?	Scoping review	33	Qualitative
Furr et al. (2015)	To review professional literature to determine best practices for implementation of service-learning and IPE into nursing curricula	Critical review	13	Qualitative
Granheim et al. (2018)	To identify how simulation and interprofessional learning are used together in undergraduate nursing programs and undertaken in schools of nursing to address interprofessional communication and collaboration	Integrative review	9	Qualitative
Gummesson et al. (2018)	To identify and develop structures for meaningful learning and interprofessional collaboration in theory courses and to explore the opportunities by developing a joint-program stand-alone module	Literature review	6	Qualitative
Horsley et al. (2018)	To understand which areas in simulation-enhanced IPE (Sim-IPE) with nursing students are well studied and which need further investigation	Integrative review	48	Qualitative
Kent & Keating (2015)	To determine what is known about IPE or the delivery of primary healthcare services when students work in primary care clinics; secondary aims were to summarise 1) disciplines involved, 2) models or frameworks for student activities, 3) services provided and 4) target group	Systematic review	26	Synthesis
Kent et al. (2017)	To ascertain the contexts, mechanisms and outcomes of formal interprofessional clinical workplace learning	Realist review	30	Qualitative

Author (Year)	Aims/Research Questions	Review Design	Number of Primary Studies Within Review	Analysis/ Synthesis
Khan et al. (2016)	To determine recent trends in IPE implementation; to discuss the various innovative approaches adopted and models developed and/or pilot-tested to deliver IPE in different parts of the world, exclusively targeting IPE issues involving undergraduate health profession trainees	Literature review	28	Qualitative
Lee et al. (2018)	To describe professions engaged in interprofessional education-focused simulations, characterise the types of simulations and review common facilitators and barriers to utilisation in the classroom, clinical and experiential settings	Scoping review	93	Qualitative
Palaganas et al. (2016)	To understand what evidence exists to support Sim IPE; to compile information for use of Sim for IPE; to identify and suggest focus areas for future research	Critical review	54	Qualitative
Ratka et al. (2017)	To describe characteristics of faculty development programs designed to facilitate IPE implementation; to compile recommendations for development, delivery and assessment of development activities	Literature overview	17	Qualitative
Reeves et al. (2010)	To assess the effectiveness of IPE interventions compared to education interventions in which the same professions were learning separately from one another and IPE interventions compared with control groups that received no education intervention	Systematic review	6	Quantitative
Reeves et al. (2011)	To develop a theoretically based and empirically tested understanding of IPE and IPC	Scoping review	104	Qualitative
Reeves et al. (2013)	To assess the effectiveness of IPE interventions compared to separate, profession-specific education interventions; to assess the effectiveness of IPE interventions compared to no education intervention	Systematic review	15	Quantitative
Vuurberg et al. (2019)	To assess the effectiveness of IPE involving pre-clinical students from medicine and at least one other healthcare curriculum	Systematic review	7	Meta-analysis

Author (Year)	Aims/Research Questions	Review Design	Number of Primary Studies Within Review	Analysis/ Synthesis
Welsch et al. (2018)	To synthesise, critically appraise and evaluate existing literature on IPE programs that utilise didactic TeamSTEPPS in conjunction with interactive healthcare simulation; to summarise the outcome measures utilised in each program and subsequent results of the didactic and simulation IPE experiences	Systematic review	11	Synthesis

Design components of included primary studies

The majority of primary studies described participants from pre-licensure programs, conducted at either undergraduate or postgraduate level, with 11 studies focusing on undergraduate learners alone (Cusack & O'Donoghue, 2012; Dando et al., 2012; Deutschlander et al., 2012; Di Prospero & Shimji-Hewitt, 2011; Galbraith et al., 2014; L. Grant et al., 2011; Masters et al., 2013; Neville et al., 2013; Reis et al., 2015; Tartavoulle et al., 2016; Topping, 2015). When there was a mixed-level participant grouping, medicine was the most common undergraduate discipline with postgraduate nurses (Djukic et al., 2012) or interpreters (Krystallidou et al., 2018). The stage of progression of the learners was inconsistently reported, but when reported, equivalence was not always present between disciplines.

Across the primary studies, 31 disciplines were involved in IPE, with the most common disciplines being medicine (n = 18), nursing (n = 10), pharmacy (n = 8) and physical therapy/physiotherapy (n = 7). Non-health professional learners, e.g., law students (Acquavita et al., 2014) also formed part of the IPE, as did clinical support professions, such as health service administrators (VanKuiken et al., 2016) and interpreters (Krystallidou et al., 2018). The number of disciplines within each IPE activity ranged from two to 11, with discipline groups of two most frequently reported (n = 8).

In the primary studies, the reported number of participants per activity varied from 16 (Watts et al., 2014) to 529 (Krystallidou et al., 2018). Within these, several IPE activities occurred recurrently over a number of years, yielding high participant numbers. The group size for the learning activities also varied, ranging from two or three (Topping, 2015) to 25 (Reis et al., 2015). Few of the primary studies detailed other important aspects of the group composition, including the discipline ratios for the group, i.e., one midwifery student to 12 medical students (Kaplan et al., 2015) or the number of active simulation participants compared with the number of active observers (Galbraith et al., 2014).

Learning constructs that were reported included theories, frameworks and objectives. A single study reported using a learning theory—Bandura's theory of self-efficacy (Galbraith et al., 2014). Five of the included studies reported designing IPE curricula or activities using either the IPEC (n = 4) (Packard et al., 2018; Reis et al., 2015; Tartavoulle

et al., 2016; Watts et al., 2014) or the CIHC (n = 1) framework (Dean et al., 2014). Other frameworks included a physician professional competency framework (Dean et al., 2014), the IDEA (interaction, data, expertise, attention) framework (Tartavoulle et al., 2016) and the Calgary-Cambridge communication skills framework (Krystallidou et al., 2018). Despite the low numbers of papers reporting IPE competency frameworks in design, 20 of the included papers reported learning objectives that included competencies contained in the CIHC framework. The reported competency domains in order of frequency were communication (n = 15), role clarification (n = 14), teamwork/functioning (n = 12), patient-centred care/safety (n = 5), collaborative leadership (n = 3) and conflict resolution (n = 2) (Table 1).

Learning approaches (exchange, observation, action, simulation, practice) were reported as being used singularly or in combinations. Nine primary studies reported using a single learning approach, with the most reported singular approach being simulation (n = 5), followed by action and exchange (n = 2). One study reported a practice-based approach, and no studies reported using observation in isolation (Table 1). The remaining studies reported using between two and five multiple approaches. Exchange was the most frequently reported approach (n = 14) and was delivered most in conjunction with simulation (n = 9), practice (n = 9) and action (n = 9).

Discussion

The findings of this review indicate incomplete reporting of IPE design components, including learning constructs and learning approaches. Those that were reported in primary studies were synthesised according to participants, learning constructs and learning approaches. These components were considered in light of the included review studies and wider literature, which enabled the development of recommendations as outlined in Table 3.

Participants

To support effective engagement in learning across discipline groups, it is important to consider the level and stage of progression and professional socialisation that participants will have experienced at the time of the IPE (Snell et al., 2020). Additionally, faculty designing IPE need to be cognisant of potential differences among learners, and activities need to be targeted to learners who are at a similar stage of development in knowledge or skills, not based on the number of years completed in their respective courses (Kaplan et al., 2015).

A variety of descriptors have been used in designing activities relevant to stages of progression, e.g., early/middle/late or novice/intermediate/entry-to-practice level (Owen, 2014). However, it may also be appropriate to design IPE activities that include pre-licensure and post-licensure participant cohorts (Watts et al., 2014), particularly if the focus of IPE is a novel experience for all and the intent in IPE design is on the progressive skill development from simple to complex or attainment to proficiency.

Table 3

Design Recommendations

Design Components	Elements	Recommendations
Participants	Level and stage of progression	• Design IPE activities for learners who are at a similar stage of progression in knowledge and skills or experience • Introduce IPE in first year and build on interprofessional competencies and related themes throughout the course/curricula (Masters et al., 2013) • Commence with simple, progressing to more complex collaborative activities over time (Kaplan et al., 2015)
	Discipline type and number	• Carefully consider the number and type of disciplines that can be included in the design of the IPE activity • Appraise the extent of previous exposure to IPE and the comparative professional socialisation that has occurred when designing discipline groupings • Design pre-licensure IPE activities where learners take on roles in their own discipline in order to promote establishment of their professional identity • When designing for small numbers of learners, consider student facilitators, which can enhance development of professional identity and collaborative leadership • Include clinical support disciplines in design to enrich IPE learning across the entire healthcare team
	Group size and ratios	• Design safe learning environments where learners have equal status and can engender positive expectations around roles and teamwork • Balance learner disciplines and numbers to most accurately reflect those in a real-life clinical scenario • Designate active observers in the participant grouping if challenged by large groups or discordant discipline learner ratios • Plan learner ratios, in particular the minimum discipline learner numbers that need to be included in the learner group to reduce isolation
Learning constructs	Theories	• Underpin IPE curricula with learning theories; learning theories can, in turn, inform approaches that are most likely to achieve the learning objectives
	Frameworks	• Strengthen design of IPE programs and activities by embedding IPE frameworks and/or professional competency frameworks • Embed IPE frameworks that are sufficiently flexible to allow for multiple professions and/or learners at multiple levels, i.e., pre- and post-licensure • Ensure professional competency frameworks are sufficiently flexible to address all stakeholder and organisational education, training and accreditation requirements
	Learning objectives	• Articulate learning objectives clearly in IPE design and consider the didactic and clinical requirements of professional accrediting bodies (Lee et al., 2018; Ratka et al., 2017), the graduate outcomes of academic institutions (Thistlethwaite & Moran, 2010) and shared stakeholder goals to ensure equal focus on the professions and clinical relevance (Horsley et al., 2018) • Consider addressing a range of competencies in design, including lesser reported IPE competencies, such as patient-centred care, leadership and conflict resolution • Design should factor in opportunities to overtly identify, discuss and debrief learning objectives with learners in relation to desired competencies and IPE frameworks

Design Components	Elements	Recommendations
Learning approach	Overall	• Consider the participant level and stage of progression and the learning setting in determining the learning approach and designing the method • Determine whether stand-alone, combined or phased methodology is the most appropriate for design of IPE and be guided by exemplars
	Exchange	• Utilise an exchange-based learning activity to orientate learners to IPE and collaborative care • Consider designing an exchange-based approach to introduce a clinical theme relevant to all learners; this will support deeper engaged learning when paired with subsequent action, simulation or practice-based approaches focused on the same clinical theme • Incorporate facilitated structured discussions to enrich interprofessional experiences using a structured plan to scaffold IPE case-based discussion (Gummesson et al., 2018)
	Observation	• Plan observation as an initial approach prior to further exchange-based or action-based IPE programs or activities • Consider designing an observation-based approach for exposure to clinical learning environments to enable deeper learning in subsequent practice-based approaches
	Action	• Case-based activities need to be realistic, engaging and designed to provide interprofessional teams with opportunities to communicate and clarify roles while delivering care • Design IPE team roles so that learners with more mature levels of expertise can assist in facilitation of the learning of those with less expertise • Consider the use of a structured interdisciplinary symposium to facilitate the design and development of a viable interprofessional program and activities (Evans et al., 2011)
	Simulation	• Consider utilising a simulated approach for more experienced learners • If simulation is to be used for novice learners, consider case studies as pre-reading to maximise the learning from the simulation session (Mendel et al., 2015) • Design detailed pre-briefing and debriefing, essential to create a psychologically safe environment • Involve more than two healthcare professions in the simulation design and secure experts as instructors (Lee et al., 2018) • Target simulation activities to the knowledge and skill levels of learners, with scenarios that are relevant to all disciplines • Design simulation debriefing to improve/highlight importance of communication between professional groups and in collaborative practice (Palaganas et al., 2016) • Consider debriefing at multiple levels: in-room, whole group and profession specific (Watts et al., 2014) • Schedule timing of debrief opportunities to minimise impact on learner performance during the actual simulation (Krystallidou et al., 2018)

Design Components	Elements	Recommendations
Learning approach continued	Practice	• Design adequate orientation to the concept of interprofessional collaborative care prior to a practice-based IPE learning experience • Provide learners with a clear understanding of interprofessional collaborative practice so that they can participate in interprofessional team duties in a practice environment (Acquavita et al., 2014; Dando et al., 2012) • Ensure adequate duration of at least 2 weeks of interprofessional clinical placements to enable achievement of learning objectives • Consider utilising health screening opportunities to structure IPE activities for community student-led clinics (Kent & Keating, 2015)

At the design stage, potential implementation challenges for combined participant cohorts should be considered. That is, undergraduate and postgraduate pre-licensure learners may have different requirements to complete the IPE activity, with activities a mandatory requirement for undergraduate learners and an elective or voluntary experience for post-graduate learners (Kaplan et al., 2015).

The number and type of disciplines appropriate to include in IPE activities is a central design consideration. A large scoping review of simulation as an IPE design approach identified that the level of engagement across learner groups increased when there was representation of more than two healthcare professions in the simulation (Lee et al., 2018). However, L. Grant et al. (2011) identified the effectiveness of just two disciplines—dental hygiene and nurses—grouped together to facilitate skills teaching using a simulation learning approach. This simple grouping resulted in significant improvements in confidence and awareness of the role of the other profession (L. Grant et al., 2011).

Many studies designed IPE for pre-determined discipline groups in a school or university. While this may reduce implementation challenges, it may also reduce authenticity in the design of the IPE activity. For example, in a first-year IPE course on communication and collaboration for seven health disciplines at the same university, participants and faculty questioned the authenticity without "key players such as physicians and nurses" (Di Prospero & Shimji-Hewitt, 2011, p. e64).

Rich learning opportunities exist when faculty look beyond traditional groupings of healthcare professions in the IPE activity, such as including public health practitioners and social workers (Lee et al., 2018). Likewise, including additional groups such as clinical support professions, for example, interpreter services (Krystallidou et al., 2018), health service administrators (VanKuiken et al., 2016) and legal services (Acquavita et al., 2014) could deepen learning opportunities.

There are numerous design considerations regarding participant group size and ratios.

The size of the group will need to be considered with respect to the desired learning outcomes, the learning approach and the learning setting. Small mixed professional groups in which participants interact, discuss and reflect tend to increase knowledge of the professional roles and teamwork skills (Kent et al., 2017). When designing for large numbers of participants, active observation in a simulation approach can increase learning opportunities and overcome implementation challenges whilst maintaining group dynamics (Galbraith et al., 2014).

Discipline ratios are also important to consider in design for learning. Kaplan et al. (2015) described an IPE course involving the grouping of 12 postgraduate medical students and one undergraduate midwifery student. The authors acknowledged the potential isolation that the single midwifery student may feel given the social bonds previously forged amongst postgraduate medical students. They identified that it is likely to be beneficial to pair student midwives within groups to reduce their feeling of professional isolation.

Learning constructs

Theories facilitate understanding of how knowledge is created and how people learn (Sargeant et al., 2006). Therefore, theories can help designers choose the most appropriate approach for IPE curricula. For example, cognitive load theory should underpin online IPE delivery (Mayer & Moreno, 2003), whereas constructivism should be considered for experiential learning approaches, such as simulation (Niederriter et al., 2020). Despite the importance of theories, a sole paper included this as a design consideration (Galbraith et al., 2014). This is consistent with review findings. Reeves et al. (2011) reported that IPE education was largely atheoretical, with only six out of 54 included papers reporting learning theories, and that these were minimally applied in the development of the learning activities (Bogossian et al., 2022).

The single paper that reported design IPE using a theoretical construct (Galbraith et al., 2014) drew on students' prior experiences and their cognitive and emotional response to a simulated approach. Students reported increased confidence in handling a death notice situation and in understanding the roles of other professionals in the team.

Despite the availability of IPE frameworks, most studies did not report grounding the design of curricula or activity on an IPE framework. Whilst none of the studies identified this as a barrier to effectiveness, frameworks are an important tool for designers to conceptualise and to organise competencies, knowledge and values critical to the design of a coherent curriculum. Frameworks provide a scaffold for students, facilitate the transfer of knowledge to new situations and enable rapid learning of related information (Tanner & Tanner, 2007). Additionally, IPE and professional frameworks contain competencies that are common to all health professions, such as communication, teamwork and role clarification. These competencies are observable and measurable, which is important when delivering IPE activities, in the assessment of learners and in evaluation of activities (Gruppen et al., 2012).

The merit of underpinning curricula and activities with an IPE framework was well demonstrated by Packard et al. (2018). The authors report an innovative approach to IPE, catering to both pre- and post-licensure learners from seven professions using the IPEC framework. IPE activities were approved based on alignment with the IPEC (2016) framework competencies, and each activity met at least three of the four IPEC competencies, while two thirds met all framework competencies. A key strength of design including this framework approach is that it is allows enough "plasticity that each profession can be confident that they meet their professions' standards" (Packard et al., 2018, p. 754)

Despite the lack of reporting in relation to the use of IPE frameworks, most included studies reported learning objectives that focused on professional competencies found in IPE competency frameworks. Few of the studies reported IPE activities focused on patient-centred care, leadership and conflict resolution. The majority focused on communication, role clarification and teamwork.

Two of the included reviews considered team-based learning. A qualitative literature review identified that training students to investigate failures in group dynamics through a team-based approach increased participants' understanding of the complexities of collaborative care (Khan et al., 2016). Kent et al. (2017) performed a realist review and identified the success of pre-registration IPE activities in the workplace that utilised patient-based learning. The study authors concluded that "when learners from different professions work together with a patient (context) and follow this with discussion and reflection (mechanism), an additional positive learning outcome is an enhanced recognition of the patient's perspective (positive outcomes)" (Kent et al., 2017, p. 911). Several studies referred to activity-based outcomes as opposed to specific learning objectives (Galbraith et al., 2014; Masters et al., 2013; Watts et al., 2014). This may be explained by these studies using a simulation-based approach focusing on a specific task or case rather than focusing on a broader approach using core competencies common to IPE frameworks, which apply across all health professions.

Learning approach

Learning approaches can be used as stand-alone IPE activities or combined to build deeper learning experiences or employed in a phased way across a curriculum (Dunston et al., 2016), moving through exposure, immersion and mastery (Charles et al., 2010). This review identified an exemplar to guide the phased methodology, The Simulated Interdisciplinary to Multidisciplinary Progressive-Level Education (SIMPLE) (Masters et al., 2013), although others have been published (Ward et al., 2018) or exist in the grey literature (Brewer, 2013).

By comparison to the classification of design approaches used in this review, Khan (2016) focused on identifying nine strategies for executing IPE activities, the majority of which are exchange-based approaches—patient-centred case studies, student-

delivered lectures, interactive lectures in a common setting and theme-centred workshops (Khan et al., 2016). Other strategies that emerged from this review included practice-based approaches—health promotion activities, rotations in rural and community settings, and interprofessional training wards and simulation-based education programs. In a large scoping review, Fox (2018) attempted to determine the most effective learning approach when engaging health professional students in IPE and concluded that most IPE activities, regardless of approach, resulted in positive changes in student perceptions and attitudes (Fox et al., 2018).

The participant stage and level of progression requires deliberation when designing the approach to utilise for an IPE learning activity. Exchange and observation can be used for early-exposure level students or as the preparatory activity prior to simulation or action-based approaches at any learner level. The learning setting will also have design influence on the approach. For example, the IPE action and practice-based approaches are more suited to learning in a clinical environment (hospital, outpatient or community setting) as opposed to learning in an academic environment, where exchange and simulation-based approaches may be more suitable.

Consistent with the wider IPE literature (Abu-Rish et al., 2012; The Interprofessional Curriculum Renewal Consortium, Australia, 2013), this scoping review identified that exchange was the most frequent design approach employed. A robust exchange-based orientation to IP teamwork, relationships and communication is deemed to be an essential building block to both orientate students to the concept of collaborative care and to enable them to more effectively participate in other IPE learning activities using action, simulation or practice-based approaches (McNaughton, 2018).

The exchange design approach is most suited to being delivered flexibly via blended and asynchronous modes, suiting large IPE cohorts. Online delivery of seminars, workshops and patient narratives can then be followed by structured online discussions. It is important when using an exchange-based approach incorporating lectures or classroom formats to appreciate that there is often insufficient time for interprofessional conversations (Kaplan et al., 2015). Case discussions also require enough time and skilled facilitation with structured scaffolding models. This allows for meaningful learning in relation to understanding multiprofessional teamwork (Gummesson et al., 2018). Observation was reported least frequently and always in conjunction with another learning approach. The most common observation method was shadowing paired with a practice-based approach.

Problem and case-based learning, joint research and clinical projects are the primary methods used in action design approaches. Emphasis needs to be placed on ensuring the case or research project design is realistic by ensuring design input by experts in the disciplines involved in the activity. Participants have reported that focusing on interprofessional core competencies, such as communication and teamwork, within a

clinically based scenario was effective in developing a shared team approach (Cusack & O'Donoghue, 2012).

The simulated environment can replicate clinical events to enable professionals from a range of fields to experience working together in a way that will allow them to reflect on collaborative practice (Van Soeren et al., 2011). Simulation combined with another design approach was reported by Palaganas et al. (2016) to achieve better results than simulation alone. VanKuiken (2016) emphasised the importance of using simpler approaches to IPE (exchange based or observation based) in a phased manner, building up to the use of simulation.

Horsley et al. (2018), in an integrative review of 48 IPE in nursing simulation studies, found that the diversity of studies and evaluation methods utilised made providing a succinct summary of recommendations for IPE simulation design difficult. Their recommendations included designing authentic complex cases that utilised debriefing methods that were appropriately team-based and having multiple simulation experiences (Horsley et al., 2018). Furthermore, a scoping review that included 93 simulation studies as an IPE design approach found the level of engagement across learner groups increased when there was involvement of more than two healthcare professions and when there was perception that the instruction was coming from an expert (Lee et al., 2018). IPE simulation faculty, thus, need to have expertise in their own discipline whilst being adept at facilitating a complex debrief with learners from a variety of different backgrounds and professional identities.

Practice (placements or work-related assignments) is a design approach that can provide rich IPE learning in hospital and community settings as well as opportunities for interprofessional collaboration. A systematic review focusing on IPE in outpatient primary care clinics identified that health screening opportunities offer a feasible consultation structure for community student-led clinics but did acknowledge that such clinics were relatively expensive to establish (Kent & Keating, 2015). Dean et al. (2014) recommend the duration of interprofessional clinical placements be at least 2 weeks to enable achievement of a structured curriculum and to allow adequate exposure to teamwork. Whilst a practice-based approach has predominantly been utilised for post-licensure learners, it can also be used for pre-licensure learners to increase awareness of interprofessional practice (Deutschlander et al., 2012).

Strengths and potential limitations

This review has reported the characteristics and design components of primary studies of IPE and synthesised recommendations from these studies and review studies to guide faculty who design IPE activities. The findings of this review need to be appraised in the context of strengths and potential limitations. While scoping reviews are not required to be comprehensive, this review was conducted using a rigorous method and approach. The search strategy was devised and undertaken by an expert librarian, followed by

independent screening of titles and abstracts, before multiprofessional pairs of researchers confirmed study inclusion and exclusion. Irrespective of this structured approach, it may be that relevant studies have been overlooked. Data charting included a consistent approach to categorisation of study designs for included primary research studies (Ranganathan & Aggarwal, 2018) and review studies (M. Grant & Booth, 2009) to overcome variability in reporting study designs. Quality appraisal was not conducted on the included studies not only because this is an optional step in scoping reviews (Cooper et al., 2021; Tricco et al., 2018) but also because we did not want to exclude potentially useful design insights in studies that were not of high quality.

While there is a reciprocal relationship between design and implementation in the conduct of IPE programs and activities, as acknowledged in the combined approach of a recent literature review (van Diggele et al., 2020), this review aimed to identify evidence specific to the design of IPE. Faculty do need to consider how implementation impacts design and vice versa. In practice, for example, implementation challenges of course enrolment numbers and timetabling may sometimes override prudent design regarding optimal participant levels, disciplines and groupings. Nonetheless, evidence-based design should be aspired to. Having previously addressed evidence in implementation of IPE (Bogossian et al., 2022) and to limit the size of this review and make recommendations useful for designers, there was a need to identify components of design discrete from those of implementation. This necessitated some arbitrary decisions.

Classification of design components for data charting was guided by selected components of existing frameworks for participants (Dunston et al., 2016) and approaches (Barr, 1996; Dunston et al., 2016), and the authors identified the component of learning constructs. Given the variable language and lack of explicit reporting in the included studies, we needed to use a degree of interpretation about some design components and acknowledge the potential for misrepresentation of the original intent. Synthesis of the recommendations for design was based on the included studies and supported by wider literature.

Conclusion

Understanding the evidence for IPE design is important to inform faculty practice. This review identified the lack of detailed and complete reporting of design components, and this may pose a challenge to faculty designing IPE programs and activities. Nonetheless, the synthesis of studies enabled the development of recommendations related to participants, learning constructs and learning approaches that can be utilised by faculty to guide IPE design for health professions.

Conflicts of interest and funding

The authors declare no conflicts of interest. This work was funded by a 2019 University of the Sunshine Coast, Commissioned Learning and Teaching Program Grant.

References

Abu-Rish, E., Kim, S., Choe, L., Varpio, L., Malik, E., White, A. A., Craddick, K., Blondon, K., Robins, L., Nagawasa, P., Thigpen, A., Chen, L. -L., Rich, J., & Zierler, B. (2012). Current trends in interprofessional education of health sciences students: A literature review. *Journal of Interprofessional Care*, *26*(6), 444–451. https://doi.org/10.3109/13561820.2012.715604

Acquavita, S. P., Lewis, M. A., Aparicio, E., & Pecukonis, E. (2014). Student perspectives on interprofessional education and experiences. *Journal of Allied Health*, *43*(2), e31–e36.

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*(1), 19–32. https://doi.org/10.1080/1364557032000119616

Barr, H. (1996). Ends and means in interprofessional education: Towards a typology. *Education for Health*, *9*(3), 341–352.

Barr, H. (2002). Interprofessional education: Today, yesterday and tomorrow. *Learning and Teaching Support Network for Health Sciences and Practice.* https://www.unmc.edu/bhecn/_documents/ipe-today-yesterday-tmmw-barr.pdf

Barr, H. (2013). Toward a theoretical framework for interprofessional education. *Journal of Interprofessional Care*, *27*(1), 4–9. https://doi.org/10.3109/13561820.2012.698328

Bogossian, F., New, K., George, K., Barr, N., Dodd, N., Hamilton, A., Nash, G., Masters, N., Pelly, F., Reid, C., Shakhovskoy, R., & Taylor, J. (2022). The implementation of interprofessional education: A scoping review. *Advances in Health Sciences Education*. Advance online publication. https://doi.org/10.1007/s10459-022-10128-4

Brewer, M. (2013). *Interprofessional capability framework: Faculty of Health Sciences*. Curtin University. https://resources.curtin.edu.au/file/faculty/hs/interprofessional_A5_broch_1-29072015.pdf

Canadian Interprofessional Health Collaborative (CIHC). (2010). *A national interprofessional competency framework*. https://phabc.org/wp-content/uploads/2015/07/CIHC-National-Interprofessional-Competency-Framework.pdf

Charles, G., Bainbridge, L., & Gilbert, J. (2010). The University of British Columbia model of interprofessional education. *Journal of Interprofessional Care*, *24*(1), 9–18. https://doi.org/10.3109/13561820903294549

Cooper, S., Cant, R., Kelly, M., Levett-Jones, T., McKenna, L., Seaton, P., & Bogossian, F. (2021). An evidence-based checklist for improving scoping review quality. *Clinical Nursing Research*, *30*(3), 230–240. https://doi.org/10.1177/1054773819846024

Curran, V., Reid, A., Reis, P., Doucet, S., Price, S., Alcock, L., & Fitzgerald, S. (2015). The use of information and communications technologies in the delivery of interprofessional education: A review of evaluation outcome levels. *Journal of Interprofessional Care*, *29*(6), 541–550. https://doi.org/10.3109/13561820.2015.1021002

Cusack, T., & O'Donoghue, G. (2012). The introduction of an interprofessional education module: Students' perceptions. *Quality in Primary Care*, *20*(3), 231–238.

Dando, N., D'Avray, L., Colman, J., Hoy, A., & Todd, J. (2012). Evaluation of an interprofessional practice placement in a UK in-patient palliative care unit. *Palliative Medicine*, *26*(2), 178–184. https://doi.org/10.1177/0269216311400479

Danielson, J., & Willgerodt, M. (2018). Building a theoretically grounded curricular framework for successful interprofessional education. *American Journal of Pharmaceutical Education*, *82*(10), 7075–7075. https://doi.org/10.5688/ajpe7075

Dean, H. J., MacDonald, L., Alessi-Severini, S., Halipchuk, J. A. C., Sellers, E. A. C., & Grymonpre, R. E. (2014). Elements and enablers for interprofessional education clinical placements in diabetes teams. *Canadian Journal of Diabetes*, *38*(4), 273–278. https://doi.org/10.1016/j.jcjd.2014.02.024

Deutschlander, S., Suter, E., & Lait, J. (2012). Models in interprofessional education: The IP enhancement approach as effective alternative. *Work*, *41*(3), 253–260. https://doi.org/10.3233/WOR-2012-1293

Di Prospero, L., & Shimji-Hewitt, S. (2011). Learning is in the facilitation: Faculty perspectives with facilitated teaching and learning—recommendations from informal discussions. *Journal of Allied Health*, *40*(4), e61–e65.

Djukic, M., Fulmer, T., Adams, J. G., Lee, S., & Triola, M. M. (2012). NYU3T: Teaching, technology, teamwork. A model for interprofessional education scalability and sustainability. *Nursing Clinics of North America*, *47*(3), 333–346. https://doi.org/10.1016/j.cnur.2012.05.003

Dunston, R., Forman, D., Moran, M., Rogers, G., Thistlethwaite, J., & Steketee, C. (2016). *Curriculum renewal in interprofessional education in health: Establishing leadership and capacity. Report to the Office for Learning and Teaching 2016*. Australian Government Office for Learning and Teaching. https://nla.gov.au/nla.obj-343770391/view

Evans, C. H., Cashman, S. B., Page, D. A., & Garr, D. R. (2011). Model approaches for advancing interprofessional prevention education. *American Journal of Preventive Medicine*, *40*(2), 245–260. https://doi.org/10.1016/j.amepre.2010.10.014

Fox, L., Onders, R., Hermansen-Kobulnicky, C. J., Nguyen, T. N., Myran, L., Linn, B., & Hornecker, J. (2018). Teaching interprofessional teamwork skills to health professional students: A scoping review. *Journal of Interprofessional Care*, *32*(2), 127–135. https://doi.org/10.1080/13561820.2017.1399868

Freeth, D., & Reeves, S. (2004). Learning to work together: Using presage, process, product (3P) model to highlight decisions and possiblities. *Journal of Interprofessional Care*, *18*(1), 43–56. https://doi.org/10.1080/13561820310001608221

Furr, S. B., Lane, S. H., Serafica, R. C., & Hodge, M. A. (2015). Service-learning and interprofessional education in nursing: A critical need. *Journal of Christian Nursing*, *32*(3), 162–167. https://doi.org/10.1097/CNJ.0000000000000178

Galbraith, A., Harder, N., Macomber, C. A., Roe, E., & Roethlisberger, K. S. (2014). Design and implementation of an interprofessional death notification simulation. *Clinical Simulation in Nursing*, *10*(2), e95–e102. https://doi.org/10.1016/j.ecns.2013.08.003

Granheim, B. M., Shaw, J. M., & Mansah, M. (2018). The use of interprofessional learning and simulation in undergraduate nursing programs to address interprofessional communication and collaboration: An integrative review of the literature. *Nurse Education Today*, *62*, 118–127. https://doi.org/10.1016/j.nedt.2017.12.021

Grant, L., McKay, L. K., Rogers, L. G., Wiesenthal, S., Cherney, S. L., & Betts, L. A. (2011). An interprofessional education initiative between students of dental hygiene and Bachelor of Science in Nursing. *Canadian Journal of Dental Hygiene*, *45*(1), 36–44.

Grant, M., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, *26*(2), 91–108. https://doi.org/10.1111/j.1471-1842.2009.00848.x

Gruppen, L. D., Mangrulkar, R. S., & Kolars, J. C. (2012). The promise of competency-based education in the health professions for improving global health. *Human Resources for Health*, *10*(1), Article 43. https://doi.org/10.1186/1478-4491-10-43

Gummesson, C., Sunden, A., & Fex, A. (2018). Clinical reasoning as a conceptual framework for interprofessional learning: A literature review and a case study. *Physical Therapy Reviews*, *23*(1), 29–34. https://doi.org/10.1080/10833196.2018.1450327

Hall, L. W., & Zierler, B. K. (2015). Interprofessional education and practice guide No. 1: Developing faculty to effectively facilitate interprofessional education. *Journal of Interprofessional Care*, *29*(1), 3–7. https://doi.org/10.3109/13561820.2014.937483

Hean, S., Craddock, D., & Hammick, M. (2012). Theoretical insights into interprofessional education: AMEE Guide No. 62. *Medical Teacher*, *32*(2), e78–e101. https://doi.org/10.3109/0142159X.2012.650740

Horsley, T. L., O'Rourke, J., Mariani, B., Doolen, J., & Pariseault, C. (2018). An integrative review of interprofessional simulation in nursing education. *Clinical Simulation in Nursing*, *22*, 5–12. https://doi.org/10.1016/j.ecns.2018.06.001

The Interprofessional Curriculum Renewal Consortium, Australia (2013). *Interprofessional Education: A national audit: Report to Health Workforce Australia*. https://sifproject.com/wp-content/uploads/2018/09/ipe_national_audit_report_australia_2013-7.pdf

Interprofessional Education Collaborative (IPEC). (2016). *Core competencies for interprofessional collaborative practice: 2016 update.* https://ipec.memberclicks.net/assets/2016-Update.pdf

Kaplan, R., Shaw-Battista, J., & Stotland, N. E. (2015). Incorporating nurse-midwifery students into graduate medical education: Lessons learned in interprofessional education. *Journal of Midwifery and Women's Health*, *60*(6), 718–726. https://doi.org/10.1111/jmwh.12315

Kent, F., Hayes, J., Glass, S., & Rees, C. E. (2017). Pre-registration interprofessional clinical education in the workplace: A realist review. *Medical Education*, *51*(9), 903–917. https://doi.org/10.1111/medu.13346

Kent, F., & Keating, J. L. (2015). Interprofessional education in primary health care for entry level students: A systematic literature review. *Nurse Education Today*, *35*(12), 1221–1231. https://doi.org/10.1016/j.nedt.2015.05.005

Khan, N. S., Shahnaz, S. I., & Gomathi, K. G. (2016). Currently available tools and teaching strategies for the interprofessional education of students in health professions: Literature review. *Sultan Qaboos University Medical Journal*, *16*(3), e277–e285. https://doi.org/10.18295/squmj.2016.16.03.003

Krystallidou, D., Van De Walle, C., Deveugele, M., Dougali, E., Mertens, F., Truwant, A., Van Praet, E., & Pype, P. (2018). Training "doctor-minded" interpreters and "interpreter-minded" doctors: The benefits of collaborative practice in interpreter training. *Interpreting*, *20*(1), 126–144. https://doi.org/10.1075/intp.00005.kry

Lapkin, S., Levett-Jones, T., & Gilligan, C. (2012). A cross-sectional survey examining the extent to which interprofessional education is used to teach nursing, pharmacy and medical students in Australian and New Zealand universities. *Journal of Interprofessional Care*, *26*(5), 390–396. https://doi.org/10.3109/13561820.2012.690009

Lee, C. A., Pais, K., Kelling, S., & Anderson, O. S. (2018). A scoping review to understand simulation used in interprofessional education. *Journal of Interprofessional Education and Practice*, *13*, 15–23. https://doi.org/10.1016/j.xjep.2018.08.003

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, *5*(1), Article 69. https://doi.org/10.1186/1748-5908-5-69

Masters, C., O'Toole Baker, V., & Jodon, H. (2013). Multidisciplinary, team-based learning: The Simulated Interdisciplinary to Multidisciplinary Progressive-Level Education (SIMPLE©) approach. *Clinical Simulation in Nursing*, *9*(5), e171–e178. https://doi.org/10.1016/j.ecns.2011.11.007

Mayer, R., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, *38*(1), 43–52. https://doi.org/10.1207/S15326985EP3801_6

McNaughton, S. (2018). The long-term impact of undergraduate interprofessional education on graduate interprofessional practice: A scoping review. *Journal of Interprofessional Care*, *32*(4), 426–435. https://doi.org/10.1080/13561820.2017.1417239

Mendel, S., Curtis, D., & Page, J. C. (2015). Interprofessional podiatric surgical simulation: A pilot study. *Journal of the American Podiatric Medical Association*, *105*(4), 331–337. https://doi.org/10.7547/13-164.1

Neville, C. C., Petro, R., Mitchell, G. K., & Brady, S. (2013). Team decision making: Design, implementation and evaluation of an interprofessional education activity for undergraduate health science students. *Journal of Interprofessional Care*, *27*(6), 523–525. https://doi.org/10.3109/13561820.2013.784731

Niederriter, J., Hovland, C., Hazelett, S., Whitford, M., Drost, J., Brown, D., Morgan, A., Kropp, D., Sanders, M., Gareri, M., Fosnight, S., Radwany, S., McQuown, C., & Ahmed, R. (2020). Using the constructivist/active learning theoretical framework to develop and test a simulation-based interprofessional geriatric training curriculum. *Journal of Interprofessional Education & Practice*, *19*, Article 100322. https://doi.org/10.1016/j.xjep.2020.100322

Owen, J. A. (2014). Interprofessional curriculum renewal consortium, Australia. *Journal of Interprofessional Care*, *28*(4), 385. https://doi.org/10.3109/13561820.2014.907701

Packard, K., Doll, J., Beran-Shepler, K., Stewart, N. H., & Maio, A. (2018). Design and implementation of the interprofessional education passport curriculum in a multi-campus university with distance learners. *Medical Science Educator*, *28*(4), 749–755. https://doi.org/10.1007/s40670-018-0589-3

Palaganas, J. C., Brunette, V., & Winslow, B. (2016). Prelicensure simulation-enhanced interprofessional education: A critical review of the research literature. *Simulation in Healthcare*, *11*(6), 404–418. https://doi.org/10.1097/sih.0000000000000175

Ranganathan, P., & Aggarwal, R. (2018). Study designs: Part 1—An overview and classification. *Perspectives in Clinical Research*, *9*(4), 184–186.

Ratka, A., Zorek, J. A., & Meyer, S. M. (2017). Overview of faculty development programs for interprofessional education. *American Journal of Pharmaceutical Education*, *81*(5), Article 96. https://doi.org/10.5688/ajpe81596

Reeves, S., Goldman, J., Gilbert, J., Tepper, J., Silver, I., Suter, E., & Zwarenstein, M. (2011). A scoping review to improve conceptual clarity of interprofessional interventions. *Journal of Interprofessional Care*, *25*(3), 167–174. https://doi.org/10.3109/13561820.2010.529960

Reeves, S., Perrier, L., Goldman, J., Freeth, D., & Zwarenstein, M. (2013). Interprofessional education: Effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*, *2013*(3), Article 2213. https://doi.org/10.1002/14651858.CD002213.pub3

Reeves, S., Zwarenstein, M., Goldman, J., Barr, H., Freeth, D., Koppel, I., & Hammick, M. (2010). The effectiveness of interprofessional education: Key findings from a new systematic review. *Journal of Interprofessional Care*, *24*(3), 230–241. https://doi.org/10.3109/13561820903163405

Reis, P. J., Faser, K., & Davis, M. (2015). A framework for web-based interprofessional education for midwifery and medical students. *Journal of Midwifery and Women's Health*, *60*(6), 713–717. https://doi.org/10.1111/jmwh.12331

Sargeant, J., Curran, V., Allen, M., Jarvis-Selinger, S., & Ho, K. (2006). Facilitating interpersonal interaction and learning online: Linking theory and practice. *Journal of Continuing Education in the Health Professions*, *26*(2), 128–136. https://doi.org/10.1002/chp.61

Shaw-Battista, J., Belew, C., Anderson, D., & van Schaik, S. (2015). Successes and challenges of interprofessional physiologic birth and obstetric emergency simulations in a nurse-midwifery education program. *Journal of Midwifery and Women's Health*, *60*(6), 735–743. https://doi.org/10.1111/jmwh.12393

Snell, R., Fyfe, S., Fyfe, G., Blackwood, D., & Itsiopoulos, C. (2020). Development of professional identity and professional socialisation in allied health students: A scoping review. *Focus on Health Professional Education*, *21*(1), 29–56. https://doi.org/10.11157/fohpe.v21i1.322

Tanner, D., & Tanner, L. (2007). *Curriculum development: Theory into practice* (4th ed.). Pearson Merrill Prentice Hall.

Tartavoulle, T. M., English, R., Gunaldo, T. P., Garbee, D., Mercante, D. E., Andrieu, S. C., & Johnson, J. L. (2016). Using the IDEA framework in an interprofessional didactic elective course to facilitate positive changes in the roles and responsibility competency. *Journal of Interprofessional Education and Practice*, *2*, 21–24. https://doi.org/10.1016/j.xjep.2016.03.003

Thistlethwaite, J. (2012). Interprofessional education: A review of context, learning and the research agenda. *Medical Education*, *46*(1), 58–70. https://doi.org/10.1111/j.1365-2923.2011.04143.x

Thistlethwaite, J., & Moran, M. (2010). Learning outcomes for interprofessional education (IPE): Literature review and synthesis. *Journal of Interprofessional Care*, *24*(5), 503–513. https://doi.org/10.3109/13561820.2010.483366

Thistlethwaite, J. E., Forman, D., Matthews, L. R., Rogers, G. D., Steketee, C., & Yassine, T. (2014). Competencies and frameworks in interprofessional education: A comparative analysis. *Academic Medicine*, *89*(6), 869–875. https://doi.org/10.1097/acm.0000000000000249

Topping, D. (2015). An interprofessional education Russian cultural competence course: Implementation and follow-up perspectives. *Journal of Interprofessional Care*, *29*(5), 501–503. https://doi.org/10.3109/13561820.2015.1012582

Tricco, A., Lillie, E., Zarin, W., O'Brien, K., Colquhoun, H., Levac, D., Moher, D., Peters, M., Horsley, T., Weeks, L., Hempel, S., Akl, E., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M., Garritty, C., & Straus, S. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, *169*(7), 467–473. https://doi.org/10.7326/M18-0850

van Diggele, C., Roberts, C., Burgess, A., & Mellis, C. (2020). Interprofessional education: Tips for design and implementation. *BMC Medical Education*, *20*(2), Article 455. https://doi.org/10.1186/s12909-020-02286-z

Van Soeren, M., Devlin-Cop, S., MacMillan, K., Baker, L., Egan-Lee, E., & Reeves, S. (2011). Simulated interprofessional education: An analysis of teaching and learning processes. *Journal of Interprofessional Care*, *25*(6), 434–440. https://doi.org/10.3109/13561820.2011.592229

Vanderzalm, J., Hall, M. D., McFarlane, L. A., Rutherford, L., & Patterson, S. K. (2013). Fostering interprofessional learning in a rehabilitation setting: Development of an interprofessional clinical learning unit. *Rehabilitation Nursing*, *38*(4), 178–185. https://doi.org/10.1002/rnj.78

VanKuiken, D. M., Schaefer, J. K., Flaum Hall, M., & Browne, F. R. (2016). Integrating interprofessional education into the curriculum: Challenges and solutions for a university without a medical center. *Journal of Interprofessional Education and Practice*, *2*, 5–11. https://doi.org/10.1016/j.xjep.2015.12.002

Vuurberg, G., Vos, J. A. M., Christoph, L. H., & de Vos, R. (2019). The effectiveness of interprofessional classroom-based education in medical curricula: A systematic review. *Journal of Interprofessional Education and Practice*, *15*, 157–167. https://doi.org/10.1016/j.xjep.2019.01.007

Ward, W., Zagoloff, A., Rieck, C., & Robiner, W. (2018). Interprofessional education: Opportunities and challenges for psychology. *Journal of Clinical Psychology in Medical Settings*, *25*(3), 250–266. https://doi.org/10.1007/s10880-017-9538-3

Watts, P., Langston, S. B., Brown, M., Prince, C., Belle, A., Skipper, M. W., King, J. P., Jr., & Moss, J. (2014). Interprofessional education: A multi-patient, team-based intensive care unit simulation. *Clinical Simulation in Nursing*, *10*(10), 521–528. https://doi.org/10.1016/j.ecns.2014.05.004

Welsch, L. A., Hoch, J., Poston, R. D., Parodi, V. A., & Akpinar-Elci, M. (2018). Interprofessional education involving didactic TeamSTEPPS® and interactive healthcare simulation: A systematic review. *Journal of Interprofessional Care*, *32*(6), 657–665. https://doi.org/10.1080/13561820.2018.1472069