

RESEARCH ARTICLE

Human-centred design thinking and public health education: A scoping review

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Abstract

Issue Addressed: Human-centred design thinking (HCDT) is gaining traction to develop appropriate public health interventions. The HCDT process helps frame problems with intention and encourages experimentation through collaboration. Public health graduates need an expanded toolkit to solve both the complex known problems of today, and the adaptability to solve the unknown problems of tomorrow. But how is the health promotion workforce being prepared with this innovation capability? This scoping review aims to provide a pedagogical understanding of teaching HCDT in public health education.

Methods: The Arksey & O'Malley framework is used to structure this review. Peer-reviewed articles written from 2000 to 2023 across eight databases were analysed. The data extracted included: author/year, setting, aim/purpose, participants, HCDT framework, HCDT methods, outcomes and challenges.

Results: Nine relevant publications were included from a total of 208 records. The first reported use of HCDT in public health and health promotion teaching was in 2015. Teaching inspiration drew from established HCDT frameworks: d.school and IDEO which promote the iterative process of empathy/inspiration, ideation and testing/implementation.

Conclusions: HCDT has been used for both designing public health curricula and for teaching students to apply it in their practice. First, HCDT methods can be used to problem-solve teaching and learning issues such as creating inviting learning environments and designing an HCDT unit. Second, the teaching of HCDT can prepare and equip the public health workforce to solve problems requiring tailored solutions from an empathetic and iterative stance working as a team. The teaching and practice of HCDT exemplifies the process of social innovation in health promotion.

So What? As an emerging field, future studies and applications should include clarifying and evaluating the HCDT stages used. More publications will enable a fuller understanding and potentially advocate the necessity of teaching and learning HCDT in public health and health promotion.

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KEYWORDS

co-design, design thinking, empathy, innovation, pedagogy

1 | INTRODUCTION

Due to renewed awareness of public health and health promotion to prevent future pandemics, the Global Academic Public Health Network¹ declared the need to fortify the multidisciplinary education of the public health workforce. Similarly, the Council of Academic Public Health Institutions Australasia has stated that public health education 'must continually evolve to equip the public health workforce with contemporary, critical knowledge, skills and teaching and learning scholarship'.^{2(p3)} Discussing the education of health professionals for the 21st century, the Lancet commission called for transformational learning which seeks to prepare graduates for 'creative adaptation of global resources to address local priorities'.^{3(p6)} Therefore, public health graduates need an expanded toolkit to solve both the complex known problems of today, and the adaptability to solve the unknown problems of tomorrow. Yesterday's solutions cannot always solve tomorrow's problems. To create positive social change, innovation is needed.

1.1 | Human-centred design thinking in public health

Human-centred design thinking (HCDT) is innovation for finding solutions; using a non-linear process of inspiration, ideation and implementation.⁴ Current HCDT processes reflect the British Design Council's⁵ Double Diamond (Figure 1). These iterative stages help

frame problems with intention and encourage experimentation through collaboration.⁶⁻⁸ While community-based participatory research has similarly championed transformative social change in public health, HCDT specifically focuses on empathy and creativity to create a tangible product or service within a shorter period of time.⁹

HCDT is being used in public health to develop user-centred practices and products.^{9,10} Bazzano et al.¹¹ conducted an interdisciplinary scoping review of human-centred design application in global health contexts. They surmised four main categories where HCDT is used: disease management related to serious or chronic illness, health systems and care management, infectious disease prevention or care, and primary prevention and health behaviour/education. Moreover, Hendricks et al.^{12(p191)} adopted human-centred design in health innovation and concluded that empathising and defining people's 'desires, needs and challenges' result in authentic solution proposals. HCDT can be seen as an innovative problem-solving skill in public health.

1.2 | HCDT in education

The use of HCDT in education has been used to develop problem-solving skills in various academic fields. Originally applied in the business and organisation fields,⁸ it is expanding to other disciplines. McLaughlin et al.¹³ surveyed 19 faculty members and 196 students from 23 courses across four universities about their design thinking practices and outcomes to inform design thinking teaching. They found skill acquisition significance for discovery and ideation based on

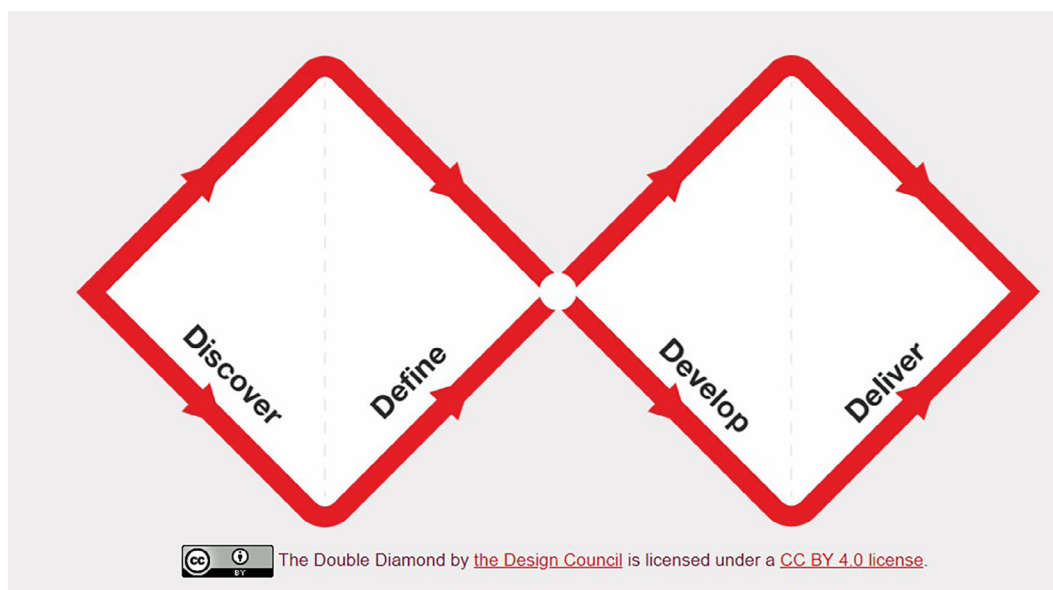


FIGURE 1 The human-centred design thinking process.

the discipline. For example, business and engineering students developed more ideas related to their problems than students from social science. In this survey, the public health field has not been singled out.

The number of investigations into design thinking and public health education while limited, are emerging internationally. In Ireland, learning outcomes of a new HCDT module aimed at postgraduate public health students were assessed.¹⁴ The 6-h module consisted of a 2-h seminar and 4 h of asynchronous lectures. Here, students reflected difficulty in the definition and ideation phases of HCDT. In the United States, a 3-h HCDT workshop was piloted in an introductory public health class to develop community understanding.¹⁵ These examples initially suggest that HCDT is useful in helping students learn to solve problems prevalent in public health. Variability, however, existed in learning outcomes and the time allocated to teaching HCDT. Not much is known collectively about HCDT teaching and learning among public health students with no known Australian examples currently.

To advance the scholarship of learning and teaching in this field, this scoping review aims to provide a pedagogical understanding of teaching HCDT in public health education. There are three supporting aims: (1) to determine public health programs using HCDT; (2) to identify the features and characteristics of HCDT teaching; and (3) to document the results of HCDT learning. The research question posed is: How is human-centred design thinking being taught in public health education?

2 | METHODS

The Arksey & O'Malley¹⁶ framework is used to structure this review. While a 2006 article¹⁷ introduced an educational focus on the process of public health program innovation, a broader time search was decided. The search strategy aimed to find peer-reviewed studies published between the years 2000 and 2023. The following eight databases were searched in January 2023: CINAHL, EMBASE, ERIC, PsycInfo, Public Health ProQuest, PubMed, SCOPUS, Web of Science. Title and abstracts using each of the keywords were searched. The keywords included: undergraduate, postgraduate, education, training, design thinking, human cent*design, design research, public health, global health, health promotion, population health and planetary health. A consistent search strategy was applied to all the databases as mentioned in the [Appendix](#). The reference list of selected articles was searched for additional sources.

2.1 | Study selection

Articles were screened for its applicability to the following inclusion criteria. The review considered the training or education of HCDT among undergraduate or postgraduate students studying in a public health-oriented program. Programs that focused on a terminal medical

degree were excluded. Titles and abstracts were screened first for appropriateness; full-text screening followed with the remaining articles.

2.2 | Data extraction

Data was extracted from the selected studies using a template outline.¹⁸ The data extracted included: author/year, setting, aim/purpose, participants, HCDT framework, HCDT methods, outcomes and challenges.

3 | RESULTS

Searches from the eight databases resulted in a total of 208 records: CINAHL (15), EMBASE (38), ERIC (3), PsycInfo (8), Public Health Proquest (12), PubMed (23), SCOPUS (74) and Web of Science (35). One additional source was found via additional searching of reference lists. After the removal of duplicates, a total of 103 articles were screened. A further 80 articles were excluded because articles had irrelevant title and abstract. The full text of one article could not be retrieved and was also excluded. The remaining 22 full-text articles were assessed for eligibility. Thirteen articles were excluded due to irrelevant population and application not specific to teaching. A total of nine articles were included in this review. The PRISMA flowchart was revised for this scoping review (Figure 2). The extracted data is shown in Table 1.

3.1 | Characterisation of the population

The included articles showcased educational offerings or use of HCDT within public health and were published between 2015 and 2022. Most of the articles^{15,19–24} reflected educational offerings in the United States. One offering was based in Ireland¹⁴ and one based in South Africa.²⁵ Of the nine offerings, eight^{14,15,19–24} included Master of Public Health students. The remaining offering²⁵ mentioned university-level health students. Seven articles^{15,20–23,25} described student enrolment over one term: ranging from three to 25. Two articles^{14,19} documented cumulative enrolment over successive offerings of the unit ranging from a total of 56–200 students.

3.2 | HCDT framework and methods

Teaching inspiration drew primarily from established leaders in the HCDT space. The Hasso Plattner Institute of Design at Stanford University or 'd.school' promotes five stages that comprise design thinking: empathise, define, ideate, prototype and test.²⁶ Three of the

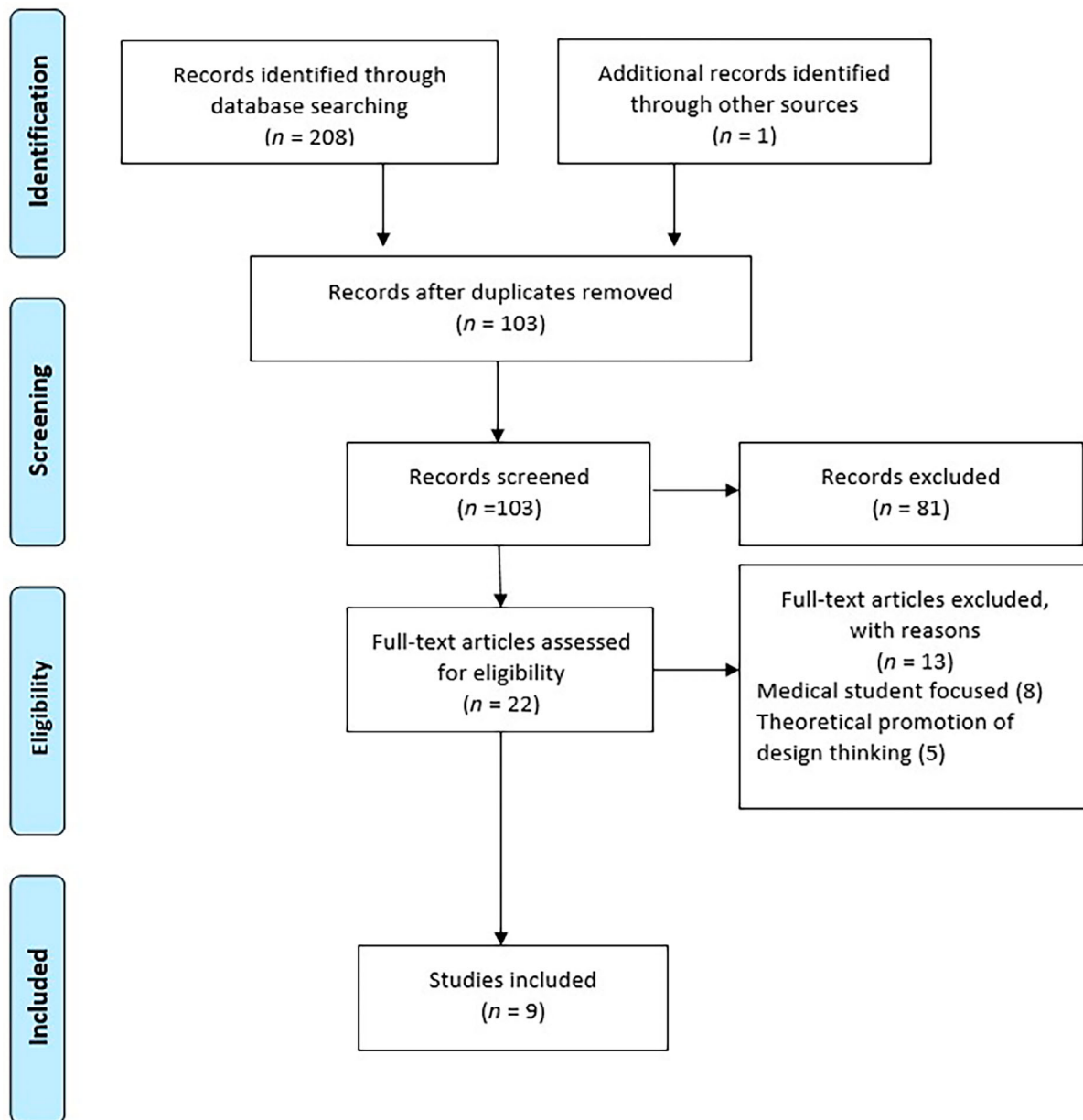


FIGURE 2 PRISMA flow diagram.

educational offerings^{14,15,20} used this method. Another four offerings^{21,23–25} relied upon the teaching of IDEO, a global consultancy that promotes three iterative stages of design thinking: inspiration, ideation and implementation.⁴ The remaining two^{19,22} did not specify their design framework but relied heavily upon system thinking to demonstrate the complexity of the issue and to allow for intervention prioritisation.

There was a variation in the depth of reporting of the HCDT methods each offering used. Three of the offerings^{19,21,23} provided broad overviews of the content provided for students. Six of the offerings^{14,15,20,21,24,25} provided detailed accounts of how the design frameworks were implemented. HCDT methods included synchronous and asynchronous lectures and guest speakers. Examples of

hands-on activities included case studies, interviews, brainstorming and creating pitches.

3.3 | HCDT offerings

Eight articles described offerings that explicitly taught HCDT and one article²⁴ used an HCDT approach for curriculum development. Table 2 describes specific characteristics of the HCDT offerings. Five of the offerings^{21–25} described an entire unit devoted to the HCDT process. Two promoted HCDT through workshops,^{15,20} and another¹⁴ dictating a three-week module within a unit. Teams ranged from two to six participants. A variety of public health issues

TABLE 1 Educational HCDDT offerings to public health students.

Author, year	Setting	Aims of study	Participants	HCDDT framework	HCDDT methods	Outcomes	Challenges
Abookire et al. (2020) ¹⁵	US, Thomas Jefferson University	Evaluate pilot HCDDT workshop	10 students, MPH	d.school, 5 stages (empathise, define, ideate, prototype, test)	Didactic introduction with case studies; hands-on design challenge. <i>Empathise:</i> interviews. <i>Define:</i> synthesise insights, write point of view. <i>Ideate:</i> generate solution sketches, revise solutions. <i>Prototype:</i> prototype solutions. <i>Testing:</i> feedback on prototypes, share prototypes.	Positive evaluation: students able to identify key concepts of design thinking and reflected positive attitudes towards workshop experience.	Understanding and applying the design mindset of fast failure
Dickey et al. (2021) ¹⁹	US, New York University/Lebanon	Document an experiential learning format to help solve complex health problems	Part of 200 professional and student cohort, MPH	Systems thinking	Online modules and live portion with intensive activities including an outbreak simulation. Groups are made to interview and observe community culminating in a communication strategy.	Development of various health strategies (e.g., monkeypox, Ebola, destroyed health systems) to be implemented in respective countries.	The experiential case study relies on defining UNICEF partnerships
Huang et al. (2018) ²⁰	US, City University of New York	Feasibility Assessment: documenting the utility of using HCDDT to teach a participatory method that activates public health solutions	5 public health faculty and 4 MPH	d.school, 5 stages (empathise, define, ideate, prototype, test)	Intensive activities with hands-on design challenge: <i>Empathise & Define:</i> implicit assumption 5-min activity; iterative design 5-min activity; 20-min identify use of parks and assumptions. <i>Ideate & Prototype:</i> 90-min ideation through open-ended questions, visualisations and iterations; 30-min mission statements; 90-90-min brainstorm sketches.	Development of students' understandings of the contribution of values, emotions and attitudes to create meaningful questions as well as the process of iteration to develop authentic solutions.	Understanding and applying the design mindsets of fast failure, releasing prior assumptions and being creative (discussing rather than sketching); unfamiliar with brainstorming and iteration; difficulty in suggesting improvements to ideas. Authors also noted unfamiliarity with non-linear thinking and the low-risk appetite inherent in health systems which may reduce adoption.

(Continues)

TABLE 1 (Continued)

Author, year	Setting	Aims of study	Participants	HCDT framework	HCDT methods	Outcomes	Challenges
Ingram et al. (2022) ¹⁴	Ireland, University College Dublin	Evaluate with a focus on the challenges, enjoyment of and observed difficulties of a HCDT unit	56 students, from 2 MPH cohorts	d.school, 5 stages (empathise, define, ideate, prototype, test)	Hands-on introductory seminar solving a carbon footprint challenge and asynchronous online lectures with offered 2 h of feedback; hands-on design challenge achieved through group assessment culminating in a pitch. <i>Empathise</i> : lit reviews, interviews, observation, extreme user interviews. <i>Define</i> : problem statement. <i>Ideation</i> : create divergent ideas and pitch.	Mixed evaluation of assessments: groups that explored topic authentic to their lives scored higher on achieving learning outcomes than those who did not.	COVID restrictions leading to online instruction; impediments to problem finding; difficulty in divergent thinking. Ability to integrate into MPH curriculum, superficial learning versus opportunity cost was also discussed.
Michael and Nicholas (2016) ²¹	US, Drexel University	Description of a course as a model for inter-professional design/health teaching to problem solve health issues	Unclear number, 2 MPH were paired with 2 Design students in each team	IDEO: hear, create, deliver and four steps of design thinking: what is, what if, what wows, what works.	Teams applied the 2 design thinking processes in parallel including using the double diamond, preparing and refining a problem statement, interviews personas, How Might We, feasibility-Desirability-Viability analysis, prototyping and delivery/testing with a pitch.	The examination and experience of interdisciplinary problem-solving processes by students. Emphasising empathy and iterative processes drives innovation.	The course was a pilot funded by a large non profit
Ramaswamy et al. (2019) ²²	US, University of North Carolina- Designing Systems for Effective Implementation (Global Public Health Concentration)	Showcase and evaluate a design-focused implementation science curriculum and its role to facilitate research findings into practice	15 enrolled of 142 of which 127 MPH student enrolment	A combination of systems thinking with unstated design framework	Asynchronous online lectures with three to four assigned readings per module and posted reflections; a progressive case-study challenge achieved through group assessment culminating in a presentation. Group assessment requires	Positive evaluation: Completing students received high grading distinctions and those that chose to continue their learning journey applied their learnings (e.g. master's papers) improving health care access among refugee populations	Helping students connect theory to practice

TABLE 1 (Continued)

Author, year	Setting	Aims of study	Participants	HCDT framework	HCDT methods	Outcomes	Challenges
Sandhu et al. (2015) ²³	US, University of California Berkeley	Describe and evaluate an HCDT unit as a blueprint for others	25 cross-disciplinary places offered each term since 2011, 50% MPH	IDEO, 3 stages (inspiration, ideation, implementation)	<p>students to redesign for improved health outcomes. Learning objectives include</p> <ul style="list-style-type: none"> apply codesign tools to find community needs (empathy maps and journey maps); develop design requirement from needs; design and prototype service delivery processes and systems. 	<p>Development and implementation of 31 community projects related to domestic and global health.</p>	<p>Maintaining financial support from sponsors to provide project funding; reiterating content each term.</p> <p>The time-consuming nature of this method was also noted.</p>
Skywark et al. (2021) ²⁴	US, University of North Carolina, Design Thinking for the Public Good (Graduate Certificate in Innovation for the Public Good)	Showcase the use of design thinking by designing an MPH unit	A curriculum development team of 3 (1 MPH, 2 public health faculty)	IDEO, 3 stages (inspiration, ideation, implementation)	<p>Online lectures with reflections, group discussions, case studies and hands-on activities. Guest lectures with embedded design sprints. <i>Inspiration:</i> frame your design challenge, build a team, recruit tools,</p>	<p>Development of interdisciplinary core unit sponsored by the schools of public health, public policy, and education, Design Thinking for the Public Good.</p>	<p>The empathy stage requires time and effort; focus on gradual release of information and acquisition of skills</p>

(Continues)

TABLE 1 (Continued)

Author, year	Setting	Aims of study	Participants	HCDT framework	HCDT methods	Outcomes	Challenges
van der Westhuizen et al. (2020) ²⁵	South Africa, University of Cape Town	Evaluate an intervention project reflective of a health HCDT unit	12 university students, health or engineering	IDEO, 3 stages (inspiration, ideation, implementation)	<p>secondary research, expert interviews, extremes and mainstreams, immersion, analogous inspiration. <i>Ideation</i>: download your learnings, find themes, create insight statements, HMW statements, design principles, brainstorm, bundle ideas, create a concept, co-creation, determine what to prototype, rapid prototyping. <i>Implementation</i>: gallery of failure, project planning.</p> <p>Training approach with practical component initiated by community partner; hands-on design challenge achieved through group assessment culminating in community presentation. <i>Inspiration</i>: assumption exercise, stakeholder maps, field interviews, problem statement, journey maps. <i>Ideation</i>: HMW statements, brainstorm ideas. <i>Implementation</i>: Develop testable prototype, sketches, presentation to community, 3 stages (inspiration, ideation, implementation)</p>	Development in student leadership and creativity.	<p>The experiential design challenge requires defining and developing relationships during a finite window; dynamic between academic constraints and community requirements, choosing conventional solutions based on ease rather than authentic fit</p>

TABLE 2 HCDT offerings.

Author	HCDT offerings	HCDT engagement duration	HCDT group formations	HCDT topic
Abookire et al. (2020) ¹⁵	Workshop pilot	2 h	2 people	Health behaviour change challenge
Dickey et al. (2021) ¹⁹	Module within Communication Strategies for Global Epidemics unit	Unspecified with a mix of online engagement and field intensives	Interdisciplinary teams of professionals, government staff and students	Communicate disease outbreaks
Huang et al. (2018) ²⁰	Workshop	1 day	4–5 people	Park usage
Ingram et al. (2022) ¹⁴	Module within Principles of Healthcare Finance and Management	3 weeks	4–5 people	Public health challenge of choice
Michael and Nicholas (2016) ²¹	Unit, Designing with Dignity	One term	4 people (2 public health students and 2 design students)	Urban housing and inequities
Ramaswamy et al. (2019) ²²	Unit, Designing Public Health Systems	One term	4–5 people	Ebola crisis in Liberia
Sandhu et al. (2015) ²³	Unit, Designing Innovative Public Health Solutions rebranded to Eat.Think.Design.	One term	3 people	Food and health
Skywark et al. (2021) ²⁴	Approach for curriculum development	4.5 months	Curriculum development team of 3 (2 faculty staff, 1 MPH)	Class objectives, assessments, and design for new unit, Design Thinking for the Public Good
van der Westhuizen et al. (2020) ²⁵	Unit, Health Innovation & Design	One term	6 people	Redesign ways to improve adherence to chronic medication in the elderly

were offered as a design challenge from prescribed (e.g., disease) or self-chosen.

3.4 | Challenges

The incorporation of HCDT into teaching offerings led to various challenges. Challenges were identified to be either conceptual (related to HCDT knowledge application) or procedural (related to professional processes of implementing the educational offering). Students were challenged in using and or applying the following design mindsets: accepting failure, releasing prior assumptions or confidence in sketching. Three design stages were highlighted as areas of concern: Empathise, Problem Finding and Ideation. One offering²⁴ noted that the empathise stage was laborious. Another offering¹⁴ noted the issues students developed with problem finding. Three offerings^{14,20,25} identified the Ideation phase as a difficult concept for students to implement whether having difficulty in thinking divergently or making suggestions to improve ideas or choosing conventional solutions because they were considered the easiest to implement.

As far as procedural challenges, when working with stakeholders, it was found difficult to identify partners and develop these relationships. Specifically, two offerings^{19,25} noted the difficult balance of

academic constraints (e.g., timeframes, expertise) and community requirements. Two offerings^{21,23} received grant funding thus continued viability is reliant on sustained support by a third party. One offering¹⁴ noted the challenges of converting to online learning due to COVID restrictions. Another offering²³ shared the challenge of developing content each year.

4 | DISCUSSION

This scoping review assessed the nature and extent of teaching HCDT in public health higher education. Its synthesis acts as a foundation to scale public health efforts to include the teaching of socially innovative thinking and methods. Social innovation has been defined as 'the process of inventing, securing support for, and implementing novel solutions to social needs and problems'.^{11(p.1)} The core elements of meeting a social need through collaborative processes align with the context of HCDT. Although relatively new to public health with first reporting of HCDT teaching in 2015, it complements the emerging practice of using HCDT in communities as an empathetic and creative approach to (1) prioritise community needs and (2) develop health initiatives.^{9–12,17} Public health graduate programs teach the why of health promotion; HCDT assists in teaching the how of health

promotion. As HCDD methods direct the problem-solving process through user needs and iteration, practitioners may develop empathy and creativity skills.^{7-9,27} In doing so, it directly supports the 'Enable Change' domain of the International Union for Health Promotion and Education Core Competencies and Professional Standard.²⁸ The teaching and practice of HCDD exemplifies the process of social innovation in health promotion. It invites the academic and professional community to incorporate HCDD into their social innovation vocabulary.

As demonstrated in this review, HCDD can be leveraged both for *designing* public health curricula and for *teaching* public health students. 'Co-creating curriculum' and 'learning together' are recommended teaching and learning strategies by the peak Australasia academic public body to prepare an adaptive workforce for a sustainable and equitable future.^{29(Ap4)} As exemplified in the one article reviewed here, the HCDD approach directly informed the development of course objectives, assessments, and unit design. Skywark et al. sought solutions to questions such as 'How might we create a learning environment that is both physically and emotionally inviting for all types of thinkers?'²⁴ Insights gathered through HCDD methods suggested a learning environment that is inclusive with equitable distribution of information. As such, they decided to host their unit completely online with synchronous group work and asynchronous reflections and assessments. Using public health education as a design challenge based on unique user perspectives may illuminate alternative avenues of teaching.¹³ However, little remains written on how HCDD approaches can be applied to curriculum development despite a growing understanding of HCDD as pedagogy.³⁰ For guidance, drawing from other disciplines is necessary. For example, HCDD has been used in the medical field to develop a community service-learning placement unit which requires an understanding of stakeholder perspectives (including students, staff and community organisations).³¹ HCDD can provide academics with methods and processes to co-design public health education with students, practitioners, and organisations to develop innovative solution-focused capability development with real-world impact.

As suggested from the findings, the incorporation of HCDD in a public health curriculum offers students an additional set of tools to problem solve using empathy and teamwork across people with different lived experiences. In health professionals, empathy is about identifying with another's feelings and acting upon that perspective.^{12,32} Targeted educational programs have been shown to nurture empathy in future public health practitioners.³³ In each of the educational opportunities assessed, there was an emphasis on empathy through role-playing and immersive experiences. HCDD does not 'presume the existence of a problem until connecting with the soul of the community'.^{7(p115)} While Dickey et al.¹⁹ superficially explored HCDD, their findings highlight the reframing of public health issues using empathetic lens. Every member of each team was assigned a role that diverged from their expertise to address the challenge at hand leading to variable insights to generate solutions. Similarly, Sandhu et al.²³ illustrated how students reframed their problems based on in-depth community observations. Michael and Nicholas²¹ demonstrated that

progressive empathy-building activities, leveraging both design thinking and social determinants of health frameworks, led to identification of unexpected connections between participants within the target community. Practicing empathy allows students to deliberate on the contribution of values, emotions and attitudes to create meaningful questions.^{15,27} This review places the teaching of empathy in the context of public health. HCDD teaching should focus on teaching the HCDD mindsets such as empathy as they are 'just as important, if not more important than methods'.^{24(p8)}

A commonality within all assessed studies within this scoping review was the focus on teamwork and team-based learning. Teamwork is a widely embedded teaching strategy in current public health education however could be further enhanced by students from diverse learning backgrounds. HCDD can provide opportunities to create new public health units which are co-delivered by schools, colleges and faculties typically outside of public health (e.g., design, business, law, information technology etc.).²⁴ This would provide all students with cross-skilling and exposure to different perspectives and ways of thinking, particularly when grouped in multidisciplinary teams for teaching and assessment activities. Such thinking paves the way to truly solve complex problems.^{27,30,34}

HCDD suggests an iterative learning process which widens and defines a problem space and then widens and narrows a solution space.^{4,6,8} Deriving consensus of how the design process is taught, however, is difficult. The reviewed educational offerings primarily drew from the d.school 5 step model or the IDEO iterative 3 step model. There is no accepted definition of the essential characteristics of HCDD to teach. At bare minimum, each of the offerings in their own way activated students' empathy, defined a meaningful health problem, brainstormed some ideas and presented an envisioned solution. The level of testing and iteration, however, is not well-defined. Nevertheless, each of these offerings provides insight in how to teach HCDD to public health students in university. By running pilot HCDD workshops, collected insights helped to create teaching material whether a module adapted to an existing unit¹⁵ or the creation of a new unit.²¹⁻²⁵ More examples, however, are needed to corroborate how to teach and the perceived benefits accrued by students, facilitators and other stakeholders.

4.1 | Strengths and limitations

This scoping review has provided one of the first broad surveys of HCDD pedagogy in public health university education. It has identified trends in teaching and areas for future investigation. These findings can directly help those educators looking to inform their teaching practice. This review, however, has some limitations. As a new field, the omission of terms may have excluded potential articles. For example, terms like 'design thinking' were used as a broad-brush search term when specific characteristics like 'empathy' and 'prototyping' may have resulted in more articles if used as additional search terms. Most studies included came from a Westernised context which provide a limited perspective of the global teaching of HCDD.

5 | CONCLUSION

This scoping review asked: How is human-centred design thinking being taught in public health education? Through a systematic process, this article has detailed the methods and findings from a search of eight databases. HCDT has been used for both designing public health curricula and teaching students to apply it in their practice. First, HCDT methods can be used to problem-solve teaching and learning issues such as creating inviting learning environments and designing an HCDT unit. Second, the teaching of HCDT can prepare and equip the public health force to solve problems requiring tailored solutions from an empathetic and iterative stance working as a team. As an emerging field, future studies and applications should include clarifying and evaluating the HCDT stages used and the types of HCDT mindsets taught. More publications will enable a fuller understanding and potentially advocate the necessity of teaching social innovative methods to promote public health.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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APPENDIX: DATABASE SEARCH RESULTS

Database: CINAHL:

1. undergraduate or postgraduate or education or training [TI Undergraduate OR AB Undergraduate OR TI postgraduate students OR AB postgraduate OR TI education OR AB education OR TI training OR AB training] (544,968)
2. “design thinking” or “human cent* design” or “design research” [TI “design thinking” OR AB “design thinking” OR TI “human cent* design” OR AB “human cent* design” OR TI “design research” OR AB “design research”] (848)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [TI “public health” OR AB “public health” OR TI “global health” OR AB “global health” OR TI “health promotion” OR AB “health”] (159,168)
4. S1 AND S2 AND S3 (15)

Database: EMBASE

1. undergraduate or postgraduate or education or training [(Undergraduate or postgraduate or education or training):ab,ti] (1,141,004)
2. “design thinking” or “human cent* design” or “design research” [(‘design thinking’ or “human cent* design” or “design research”):ab,ti] (1,504)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [(“public health” or “global health” or “health promotion” or “population health” or “planetary health”):ab,ti] (401,493)
4. #1 AND #2 AND #3 (38)

Database: ERIC

1. undergraduate or postgraduate or education or training [TI Undergraduate OR AB Undergraduate OR TI postgraduate students OR AB postgraduate OR TI education OR AB education OR TI training OR AB training] (728,735)
2. “design thinking” or “human cent* design” or “design research” [TI “design thinking” OR AB “design thinking” OR TI “human cent* design” OR AB “human cent* design” OR TI “design research” OR AB “design research”] (1,503)

3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [TI “public health” OR AB “public health” OR TI “global health” OR AB “global health” OR TI “health promotion” OR AB “health promotion” OR TI “population health” OR AB “population health” OR TI “planetary health” OR AB “planetary health”] (7,489)
4. S1 AND S2 AND S3 (3)

Database: PsycINFO

1. undergraduate or postgraduate or education or training [(undergraduate or postgraduate or education or training).ab. or (undergraduate or postgraduate or education or training).ti.] (489,098)
2. “design thinking” or “human cent* design” or “design research” [(design thinking or human cent* design or design research).ab,ti.] (1,558)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [(public health or global health or health promotion or population health or planetary health).ab,ti.] (71,903)
4. 1 and 2 and 3 (8)

Database: Public Health Proquest:

1. undergraduate or postgraduate or education or training [title(undergraduate) OR abstract(undergraduate) OR title(postgraduate) OR abstract(postgraduate) OR title(education) OR abstract(education) OR title(training) OR abstract(training)] (233,747)
2. “design thinking” or “human cent* design” or “design research” [title(“design thinking”) OR abstract(“design thinking”) OR title(“human cent* design”) OR abstract(“human cent* design”) OR title(“design research”) OR abstract(“design research”)] (374)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [title(“public health”) OR abstract(“public health”) OR title(“global health”) OR abstract(“global health”) OR title(“health promotion”) OR abstract(“health promotion”) OR title(“population health”) OR abstract(“population health”) OR title(“planetary health”) OR abstract(“planetary health”)] (155,000)
4. S1 AND S2 AND S3 (12)

Database: PubMed

1. undergraduate or postgraduate or education or training [(((undergraduate[Title/Abstract]) OR (postgraduate[Title/Abstract])) OR (education[Title/Abstract])) OR (training[Title/Abstract]))] (1,053,210)
2. “design thinking” or “human cent* design” or “design research” [(“design thinking”[Title/Abstract]) OR (“human cent* design”[Title/Abstract]) OR (“design research”[Title/Abstract])] (1,174)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [(((“public health”[Title/Abstract]) OR (“global health”[Title/Abstract])) OR (“health promotion”[Title/Abstract]) OR (“population health”[Title/Abstract]) OR (“planetary health”[Title/Abstract]))] (431,813)
4. (((((undergraduate[Title/Abstract]) OR (postgraduate[Title/Abstract])) OR (education[Title/Abstract])) OR (training[Title/Abstract])) AND (((“design thinking”[Title/Abstract]) OR (“human cent* design”[Title/Abstract]) OR (“design research”[Title/Abstract])) AND (((“public health”[Title/Abstract]) OR (“global health”[Title/Abstract])) OR (“health promotion”[Title/Abstract]) OR (“population health”[Title/Abstract]) OR (“planetary health”[Title/Abstract]))] (23)

Database: SCOPUS

1. undergraduate or postgraduate or education or training [(TITLE (undergraduate) OR ABS (undergraduate) OR TITLE (postgraduate) OR ABS (postgraduate) OR TITLE (education) OR ABS (education) OR TITLE (training) OR ABS (training))] (2,759,874)
2. “design thinking” or “human cent* design” or “design research” [(TITLE (“design thinking”) OR ABS (“design thinking”) OR TITLE (“human cent* design”) OR ABS (“human cent* design”) OR TITLE (“design research”) OR ABS (“design research”))] (17063)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [(TITLE (“public health”) OR ABS (“public health”) OR TITLE (“global health”)

OR ABS (“global health”) OR TITLE (“health promotion”) OR ABS (“health promotion”) OR TITLE (“population health”) OR ABS (“population health”) OR TITLE (“planetary health”) OR ABS (“planetary health”)] (510,081)

4. ((TITLE (undergraduate) OR ABS (undergraduate) OR TITLE (postgraduate) OR ABS (postgraduate) OR TITLE (education) OR ABS (education) OR TITLE (training) OR ABS (training))) AND ((TITLE (“public health”) OR ABS (“public health”) OR TITLE (“global health”) OR ABS (“global health”) OR TITLE (“health promotion”) OR ABS (“health promotion”) OR TITLE (“population health”) OR ABS (“population health”) OR TITLE (“planetary health”) OR ABS (“planetary health”))) AND ((TITLE (“design thinking”) OR ABS (“design thinking”) OR TITLE (“human cent* design”) OR ABS (“human cent* design”) OR TITLE (“design research”) OR ABS (“design research”))) (74)

Database: Web of Science

1. undergraduate or postgraduate or education or training [Undergraduate (Title) or Undergraduate (Abstract) or postgraduate (Title) or postgraduate (Abstract) or education (Title) or education (Abstract) or training (Title) or training (Abstract)] (2,160,862)
2. “design thinking” or “human cent* design” or “design research” [“design thinking” (Title) or “design thinking” (Abstract) or “human cent* design” (Title) or “human cent* design” (Abstract) or “design research” (Title) or “design research” (Abstract)] (9,692)
3. “public health” or “global health” or “health promotion” or “population health” or “planetary health” [“public health” (Title) or “public health” (Abstract) or “global health” (Title) or “global health” (Abstract) or “health promotion” (Title) or “health promotion” (Abstract) or “population health” (Title) or “population health” (Abstract) or “planetary health” (Title) or “planetary health” (Abstract)] (361,652)
4. #1 AND #2 AND #3 (35)