Received: 18 February 2022 | Revised: 22 July 2022 | Accepted: 26 July 2022

DOI: 10.1002/hpja.646

RESEARCH ARTICLE

Health Promotion Journal of Australia

Australian Health Promotion Association

WILEY

Student reflections on an interdisciplinary pandemics course utilising systems thinking

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Abstract

Issue addressed: The complexity and uncertainty of the COVID-19 pandemic highlights the need to change training of public health professionals in higher education by shifting from siloed specialisations to interdisciplinary collaboration. At the end of 2020 and 2021, public health professionals collaboratively designed and delivered, a week-long intensive course—Public Health in Pandemics. The aim of this research study was to understand whether the use of systems thinking in the design and delivery of the course enabled students to grasp the interdisciplinary nature of contemporary health promotion and public health practice.

Research methods: Two focus group interviews ($n = 5$ and 3/47) and a course opinion survey ($n = 11/47$) were utilised to gather information from students regarding experiences and perceptions of course design and delivery, and to determine if students felt better able to understand the complex nature of pandemics and pandemic responses.

Major findings: Students provided positive feedback on the course and believed that the course design and delivery assisted in understanding the complex nature of health problems and the ways in which health promotion and public health practitioners need to work across sectors with diverse disciplines for pandemic responses.

Conclusions: The use of an integrated interdisciplinary approach to course design and delivery enabled students used systems thinking to understand the complexity in preparing for and responding to a pandemic. This approach may have utility in preparing an agile, iterative and adaptive health promotion and public health workforce more capable of facing the challenges and complexity in public health.

KEYWORDS

curriculum and pedagogy, health promotion, interdisciplinary, public health

1 | INTRODUCTION

1.1 | Public health and health promotion education nexus

There are increasing calls for the use of integrated and collaborative approaches to address the growing complexity of contemporary health issues. The World Federation of Public Health Associations (WFPHA) in partnership with the World Health Organization (WHO) established the "Global Charter for Public Health" in 2016 to address the fragmented nature of public health services and functions. The Global Charter includes objectives for building resilient public health systems that incorporate inter-sectoral and interdisciplinary collaboration (WFPHA[1]). This acknowledges the nexus between prevention, promotion and protection of health, underpinned by foundational functions of governance, advocacy, capacity and information (WFPHA[1]). The WHO[2] has called for a change in the way the public health workforce is trained and prepared to manage increasingly complex health issues in uncertain times that moves away from siloed[3] specialisations to a greater focus on interdisciplinary collaboration. Additionally, WHO proposes professional training to be transformative and focus on lifelong learning to better equip public health professionals with skills to "prevent disease, prolong life and protect and promote the health of …communities" (p. 7). The COVID-19 pandemic has both disrupted and provided an opportunity for expansion of public health education and training as more people become aware of the roles the public health workforce performs.[4] However, educators must be able to leverage and extrapolate this personal experience to a broader focus on population-level health initiatives.

Public health educators utilise several health promotion and public health competency frameworks to support the design of courses that include a shift to more interdisciplinary curricula.[1] These include the International Union for Health Promotion and Education (IUHPE) Core Competencies and Professional Standards for Health Promotion,[5] the WHO-ASPHER (Association of Schools of Public Health in the European Region) Competency Framework for the Public Health Workforce[2] and in Australia, the Council of Public Health Institutions of Australia (CAPHIA) Foundation Competencies.[6] Designing new interdisciplinary curricula is challenging because of the lack of evidence on best practice for course or curriculum design using interdisciplinary approaches in the context of health sciences,[7] particularly when also incorporating systems thinking.

Systems thinking is a structured thought process that focuses on the inter-relationships between its constituent parts and how the system works within a larger system.[8] It is particularly useful in enabling an understanding causality and change that is not linear and always predictable.[8] Systems thinking approaches have been used to support greater student learning outcomes that include an understanding of the interdependencies, interactions and interrelations across and within systems.[9] The recent revision of the WHO competencies for the public health workforce includes systems-thinking as a core competency.[2] In addition,[10] argues that it is an important approach in health promotion practice that is better able to explain complexity and lead to sustainable approaches in health systems. According to Rosa[8]:

> Systems thinking is a broad paradigm concerned with inter-relationships, perspectives and boundaries … Not content specific or influenced by a single discipline, systems-thinking is a formal, abstract and structured thought process drawing on several unique cognitive skills … For example, systems-as-cause and closed loop thinking allow members to better understand causality and change that is not linear and always predictable … (p. 302).

Sharma and Mattheson[11] argued that health promotion is epistemologically and methodologically aligned with systems thinking and that it "sits comfortably with the transdisciplinary nature of the health promotion discipline" (p. 1).

Interdisciplinary teaching has been shown to increase student learning, and can lead to improved cognitive abilities.[12] Importantly, education researchers note the benefits of interdisciplinary approaches to teaching and learning including the ability to recognize bias, think critically, tolerate ambiguity and acknowledge and appreciate ethical issues[13,14] Interdisciplinary teaching supports students in putting aside their pre-existing notions and develop insights into the role of different disciplines.[12] Taken together, a system thinking approach that integrates the different perspectives of the disciplines integral to public health and health promotion, could support learning. This article presents a concrete example of how an interdisciplinary course, Public Health in Pandemics, was designed and delivered utilising systems thinking, guided by the WHO-ASPHER and IUHPE[5] competency frameworks.

1.2 | Design of Public Health in Pandemics course

The teaching team were presented with the opportunity to design a short intensive course* PUBH7116 Public Health in Pandemics at the end of 2020, which was delivered for a second time in 2021. The course was an elective in the Master of Public Health (MPH) program but was open to students from other programs. The course was designed and delivered collaboratively with experts from a range of diverse disciplines including health promotion, public health, One Health,† health policy, history, epidemiology, virology, economics and law, and was supported by a dedicated learning designer. The decision to use systems thinking to frame the course curriculum was made to ensure students developed an understanding of how the approach can be used to understand and manage complex problems. It addressed the WHO-ASPHER Competency 5.9, Relations and Interactions to, "…[u]nderstand the principles of systems thinking and… apply them within systematic enquiry to analyse, model and improve public health organizations and services at different strategic levels" (WHO[2]). The curriculum included instruction in the principles and techniques used to develop systems models and to use them to

identify points for intervention. The knowledge and skills learnt in the course were assessed using an open access COVID-19 simulator that uses a systems dynamics simulation model accessed via a web interface (Isee Systems Inc.[16]). The simulator allows users to modify the parameters of control variables such as contact tracing efficiency, testing rates and quarantine and simulate their impact on COVID-19 case numbers over time compared with a "base-case" that reflects the status quo.

Each day of the intensive course was organised around a specific theme that tracked the evolution of the public health response to the pandemic predominantly in the Australian context. This commenced with the start of the pandemic, tracking initial responses including failures, progressing to subsequent waves, examining the post pandemic phase with an emphasis on communicating and finally putting all the pieces of the pandemic puzzle together (Figure 1). Individual sessions across each day were facilitated by discipline experts that spoke to the "parts of the system" involved in understanding and responding to pandemics. For example, on day one, the second session concerned historical perspectives of pandemics and was facilitated by a history expert (Content and Context Competency); the impact of pandemic responses from an equity lens delivered by a public health sociologist (Science and Practice Competency); and on day three there was a session with an overview of public health law, human rights and legal implications of the response delivered by a health policy specialist with an extensive background in international law, global health policy and human rights. A total of 16 co-presenters from diverse fields were supported by the course coordinator to deliver 25 sessions over the duration of the week-long intensive course – weaving together the complex and complicated story of pandemics, pandemic response management and the broad social, political, economic and medical implications.

A key strategy that was applied in the design of the course was to provide formal opportunities for students to reflect on course content. The use of reflection and reflective practice in higher education is not new,[17] and can improve learning outcomes and engagement.[18] Reflection has different levels and can help to bridge the theory/practice divide. Critical reflection bridges the "what" and "how" with the "why"—raising issues of ethics, politics and inequities and injustices.[19] Given the complexity and diversity of the disciplinary-specific content that was being covered each day, building in dedicated and purposeful reflection aimed to support students and provide space for processing and thinking through how each of the discipline contributed to a system.

At the conclusion of each session, that is, three to four times per day, students were given the opportunity to reflect on what they had seen and heard and take notes. As part of the first assessment task for the course, students were required to upload a 2-min video blog (Vlog) reflection based on the day's proceedings for the first 4 days of the teaching week (worth 2% each). Students were able to reflect on any aspect of the content presented in the day and were directed to structure their Vlog using Kolb's[20] Experiential Learning Framework to assist in structuring their response. Within this framework, students were instructed to both refer to any relevant literature and to consider ways in which this learning experience might impact on them both personally and professionally. At the conclusion of the teaching week, students were to use this information to construct a written meta-reflection on the course, which formed part of their assessment (worth 12% of the final grade).

2 | METHODOLOGY AND METHODS

This research project was grounded within an action-research methodology, the main aim to improve practice and study the effects of the action—in this instance—pedagogy. According to Punch and Oancea[21] this research begins with "a practical question and aims to

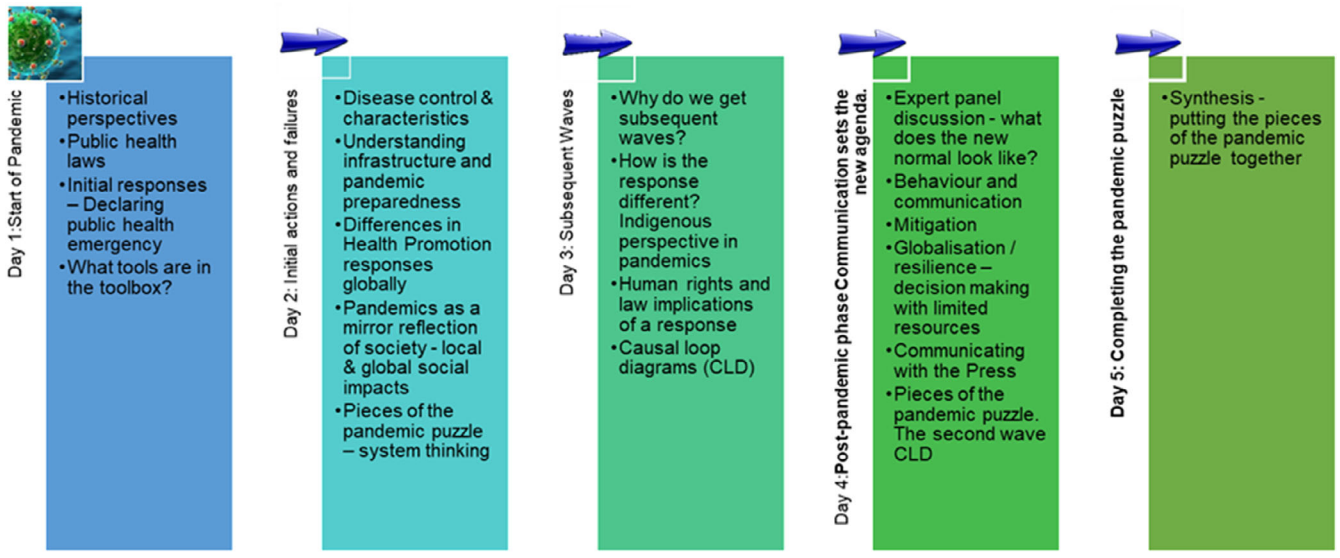

FIGURE 1 Overall organisation of the week-long intensive course PUBH7116—Public Health in Pandemics

improve educational practices (p. 172) and findings applied to future iterations of the course as part of on-going course reflection, renewal and improvement. Constructivism was the theoretical perspective that informed this research to identify the meaning individuals involved in the course gave to the experience of the teaching teams pedagogical endeavours.[22] The main research question driving this research project was "did the collaborative design and delivery of PUBH7116 Public Health in Pandemics help students to understand the interdisciplinary nature of contemporary health promotion and public health practice?" Ethical approval for this research was granted by the Human Research Ethics Committee (2021/HE002599).

2.1 | Data collection

2.1.1 | Focus group interviews

During the 2021 iteration of the course, all enrolled students were invited to participate in focus group interviews (FGI) via an announcement placed on the course Blackboard site and verbally by the course coordinator during the teaching sessions. Questions for the FGI covered a range of aspects of course delivery including the use of multiple presenters from different disciplinary backgrounds, cohesion of content and complexity of pandemic control and management. A further question asked students to reflect on the potential of incorporating inter-disciplinary approaches in their own practice.

To address ethical concerns, the FGI were conducted by a non-teaching member of the research team to avoid potential conflicts of interest and/or power differentials. Interviews were recorded, the first on Zoom and the second by audio recording device and transcribed by a professional third-party transcription service. Transcripts were emailed to participants as a quality assurance measure to ensure accuracy. A deductive thematic analysis approach was taken using a six-stage process as outlined by Braun and Clarke.[23] This involved data familiarisation; generating initial codes; searching for themes; reviewing themes; defining and naming themes. The themes largely reflected the questions that were asked, however some sub themes emerged as result of the semi-structured nature of the interview. For example, while a question regarding the use of the systems-modelling software was not on the interview question schedule, it was raised by students who were struggling with mastering the software. One member of the research team performed the thematic analysis and then cross-checked with other authors.

2.1.2 | Exit survey (online)

At the conclusion of teaching on the fifth and final day, all enrolled students were invited to complete a short online survey via an announcement on the course learning management system site. The survey contained 17 closed questions (using Likert scales) and three open-ended questions. Questions included information on basic demographic information (age, gender and current employment information), undergraduate study area and student opinions of the overall course experience, course design and delivery and assessment. The survey contained questions regarding best/least valuable aspects of the course; favourite session; the use of systems modelling; the representation of pandemic complexity; the cohesiveness of the course content and presenters and questions regarding assessment. The survey took approximately 15 min to complete. Individual responses were analysed by comparing the frequencies of each student's response to close-ended questions using Microsoft Excel.

3 | RESULTS

A total of 47 students enrolled and completed the requirements of the course (23 in-person, 24 online students). The students that enrolled in this course were from multiple backgrounds, with 68% completing it as part of their MPH, and 32% from other programs including audiology, epidemiology, environmental health and Graduate Certificates in Public Health. Of the total number of students enrolled, 31 were female, and 16 male and 12 students were enrolled as international. Over 26% of those enrolled, were completing the Health Promotion field of study.

3.1 | Focus group interviews

A total of eight students agreed to be interviewed in the FGI (three males and five females). Subsequently, two FGI were conducted on the Wednesday and Thursday of the intensive teaching week. We were keen to capture students while they were attending the course, as students were enrolled in the course nationally and internationally and the multiple time zones were tricky to navigate outside scheduled course hours. Additionally, our prior experience with students enrolled in short courses suggested they are time poor and unlikely to make time for course evaluations after the course was completed – as evidenced by the fact that no students completed the student evaluations on this course the previous year. The first FGI was conducted online via Zoom on Wednesday (day three) during the lunch break and consisted of five participants. Two students were enrolled online—one in Singapore and one locally; other three students were enrolled face to face but chose to attend the Zoom interview. This interview lasted 41:21 min. Of these students, two were full time students, one was working in public health; one in higher education sector and the other a scientist. The second FGI interview was conducted face-to-face at the conclusion of teaching on Thursday (day 4) with three participants. The three participants had biomedical backgrounds. This interview was 48:05 min in duration.

3.2 | Online exit survey

Thirteen students commenced the online exit survey and eleven completed all survey questions, indicating a response rate of 23%. Of

these students—36% ($n = 4$) were under 25 years old, 36% ($n = 4$) were between 25 and 44 years of age, 27% ($n = 3$) were aged between 45 and 54 years of age. Most respondents were female ($n = 7$, 64%). Most students indicated that they enjoyed the course ($n = 9$, 82%), with this same nine students indicating they would recommend the course to fellow students or colleagues, with one indicating they were unsure. One student said they had only somewhat enjoyed the course and would not recommend it yet noted that they found the course challenging to keep up with online, particularly as an international student. Overall, 90% of respondents indicated that complexity of the pandemic was sufficiently presented in the course, and they found the systems thinking approach was useful in helping them engage effectively and understand this complexity. Importantly, 90% of students also indicated that the multiple presenters reflecting different disciplinary experts helped them to understand how disciplines work together in practice for pandemic response and management.

3.3 | Key themes from focus groups and open-ended questions

The following sections describe the key themes that emerged from the FGI according to the deductive thematic analysis that was conducted combined with the data from the exit survey.

3.3.1 | Student perspectives on the interdisciplinary approach

Participants in the FGI were overwhelmingly in favour of the interdisciplinary approach used to design and deliver the course. Students liked the use of disciplinary experts, as the multiple presenters represented a broad range of views, perspectives and expertise. Students also noted that they enjoyed having an opportunity to learn from so many different academics and being given the opportunity to evaluate the pandemic from multiple perspectives. Additionally, participants indicated an appreciation of how the multiple presenters assisted them maintain focus given the intensive nature of the course, with Student A stating that: "with the long day format. It's been good to break it up with different people. I think if it was just the same person, even if they were super engaging, that would've been really hard to listen to the whole time." Students appreciated the interdisciplinary approach as it enabled them the opportunity to stand back and look at the bigger picture view of the pandemic and realise it is more than just doctors involved in pandemic response. According to Student G "… it's definitely illustrated that you need more than just public health people and doctors making decisions." This sentiment was also captured by Student F stating that:

> … it exemplifies and helps make sense of the complexity. And on a personal level, dealing with it. So, [being] on the front line constantly, it's actually really useful for me to step back and to look at the other perspectives in a less emotional manner …

And for Student H, who had a biomedical background, the absence of the inclusion of front-line workers was noted—perhaps suggesting his/her clinical bias/focus, stating that "a couple of students did note that it would have been good to include the perspective of frontline workers dealing with the COVID-19 patients."

3.3.2 | Perceived cohesiveness of the course

One of the concerns in designing the course with multiple experts presenting information was that the course would lose the cohesive narrative that was intentionally designed to tell the story of pandemic response and management. Students did note some repetition between presenters but viewed this as reinforcing rather than repetitive. Overall, students thought the multiple presenters in the course were coherent and well-integrated. Students did notice differences between presenters but felt that the differences were complementary—not contradictory and were necessary to present multiple viewpoints. This feeling was captured by Student G stating that the course was:

> … generally cohesive. I don't think anything has been contradictory at all and I think it reflects the complexity of pandemics. And so, I think I can see the reason that they've gotten a lot of these different viewpoints, because you do get different people's perspective on all of this, which is exactly what you get in a pandemic.

3.3.3 | Students' ability to link course learnings to practice

With respect to using an interdisciplinary approach and students making the link to their own professional practice in health promotion and/or public health, students agreed that the pedagogical approach made them appreciate the need to involve multiple perspectives and stakeholders to address the issue of the COVID-19 pandemic. Additionally, some students, like Student B, realised the "importance of including different communities and communicating decision making with them." The intention to apply interdisciplinary approaches in future practice was perhaps best summarised by Student F:

> Especially now during COVID, it's become much more important to communicate better, not just within hospital colleagues, but within external stakeholders and external organizations and bodies that we didn't previously. … And now I have to learn to collaborate, and I have to realize the world is bigger.

It was interesting to see if students themselves could envision taking the interdisciplinary approach that was modelled in the course and

implementing it in their future practice as health promotion practitioners, or in the broader field of public health. On this issue, FGI participants were certainly hopeful. Students appreciated the fact that complex health issues required complex approaches to even begin to address. This feeling was captured by Student A stating that "we can see now that without the interdisciplinary approach, then you are not going to solve the problem." Additionally, it appears that the course has broadened students' understanding of the people who need to be involved in addressing these complex health issues. According to Student B, "… and not just interdisciplinary from a workplace or a career perspective, but also involving communities in decision making. … The importance of including different communities and communicating decision making with them." Student D who was hoping to enter the field of health promotion when she graduated stated:

> As someone who's just only had public health as their academic discipline, it's been really good to open up and realize that because of that, I've got a very one-way view of how health promotion should work. And so, as someone hoping to go into the field, it'll be good having those multiple perspectives to interact better with the wide variety of fields that we have to [work with].

3.3.4 | Student thoughts on the use of reflection

One of the tools that students noted as being central to supporting them in processing information was the embedded structured reflection at the end of each intensive day and at the end of each session. Students were very much in favour of the multiple opportunities to reflect provided during the course but there was some conjecture regarding the format. For Student F:

> I had reflections during my [undergraduate] training, and they were terribly done. It was so tokenistic. And just having five minutes at the end of the lecture that's embedded in the plan is actually really useful, to just go through it and go, okay, what have I just learned? What have I just gone through? And especially in this subject matter, it raises a lot of questions. Like, ooh, I hadn't thought of this, or this is a really big deal. How do you bring these things together? And if you don't reflect on it, you miss the opportunity to integrate it later, I think. So, the principle is great.

While Student G appreciated the multiple opportunities to reflect during the teaching week, this was not supported with the Vlog assessment design, indicating preference for a written reflection:

> I'm happy to reflect, just get me to do a 250 or 500 word. I think the reflection bit is good, I just hate the format. Sitting in front of something and videoing, some people just don't like being videoed … The way that you guys are doing it here is really good. Where you get people to actually sit down five minutes at the end of the lecture and actually think about what you've learned and what you're thinking, because you won't remember that later on.

Overall, the exit survey revealed that all students found the Vlog reflection task to be useful in assisting reflection on the course content, and to think about how they could apply what they were learning to professional practice.

3.3.5 | Students experience of systems thinking and systems-modelling software

It is perhaps not surprising that in using a systems approach to thinking about and teaching this course, students indicated feeling overwhelmed by the enormity of addressing complex health problems such as pandemics. Student C reflected that while still at the beginning of a public health career the problem encountered during the week was "overwhelming …complex …and …not simple. So, I think if we didn't feel overwhelmed, maybe we are not paying attention …." Despite this concern, participants in the focus groups generally felt that the course provided them with sufficient "tools in the toolbox" (i.e., knowledge and skills) to support their learning and their professional practice moving forward.

Regarding the use of systems thinking modelling software, when students were interviewed during the intensive teaching week, they were struggling with the technical aspects of learning to use the Isee Systems Inc.[16] software, and were quite focussed on these aspects, and not able to yet comment on the use of systems modelling and its utility in illustrating complexity. Comments like these made by Student D were common, "I was able to make the arrows, I was able to colour them and make the loops …but I was a tiny bit lost." However, by the end of the week some students were starting to grasp the tool and were able to understand the utility, including the limitations of systems-modelling to support bringing the pieces of a complex puzzle together. Students mentioned the systems modelling/thinking in their meta reflections submitted as part of the first assessment task, the weekend after the course concluded. According to Student F:

> Modelling rapidly emerging and changing data during these times has incredible challenges and it seems impossible to know where to even start. The introduction during the course to systems thinking was very helpful as an aid to disentangle some of these complex relationships of various factors and try and understand potential avenues of intervention and change …. However, it also highlighted to me that a model is only as good as it's data, and the parameters that we chose and how interpret the data is entirely determined by our worldview and therefore contain inevitable biases.

Further, no model can encompass all variables. Specifically, each country, region, community and group will have specific variables that are unique to them and will influence what areas of need, areas of strength and resilience and areas of friction there will be. Clearly, there is no single solution to a complex problem, but multiple solutions adjusted over time.

TABLE 1 WHO-ASPHER Competencies Framework (2020) domains with specific elements that informed the design of PUBH7116 underlined

Content and context	Relations and interactions	Performance and achievement
1. Science and practice 2. Promoting health 3. Law, policies and ethics 4. One Health[a] and health security	5. Leadership and systems thinking 6. Collaboration and partnerships 7. Communication, culture and advocacy	8. Governance and resource management 9. Professional development and reflective ethical practice 10. Organisational literacy and adaptability

[a]See Footnote 2.

4 | DISCUSSION/IMPLICATIONS

In this article, the teaching team have attempted to respond to Merzel et al.'s[24] calls to "… scrutiniz(e) the art and science of public health pedagogy" (p. 679) by presenting student insight into attempts to use the WHO-ASPHER Competency Framework[2] to inform the curriculum design and associated pedagogy of a short course—Public Health in Pandemics (Table 1). The teaching team are cautiously confident that by using the framework to guide curriculum planning, a truly interdisciplinary public health course was successfully designed. A course that has moved away from traditional siloed approaches to interdisciplinary teaching in public health and health promotion. The following discussion will focus on the specific WHO-ASPHER Competencies Framework[2] (Table 2) elements that informed the course planning.

TABLE 2 Domains and elements of WHO-ASPHER Competency Framework for Public Health Workforce in Europe as mapped against content of PUBH7116 Public Health in Pandemics

WHO-ASPER Competency framework (2020) domains	WHO-ASPER competency framework specific element	Where specific element aligned with PUBH7116 Public Health in Pandemics
Content and context	1. Science and practice	Day 1—Historical perspectives; Initial Responses
		Day 2—Disease control and characteristics and Understanding infrastructure and pandemic preparedness
		Day 3—Why do we get subsequent waves?
		Day 4—Mitigation and Globalisation/resilience—decision making with limited resources
	2. Promoting health	Day 1—What tools are in the toolbox?
		Day 2—Differences in health promotion responses globally and Pandemics as a mirror reflection of society—local and global social impacts
		Day 3—How is the response different? Indigenous perspectives
	3. Law, policies and ethics	Day 1—Public health laws
		Day 3—Human rights and law implications of a response
	4. One Health and health security	Day 3—Causal loop diagrams (CLD)
		Day 4—Pieces of the pandemic puzzle. The second wave CLD
Relations and interactions	5. Leadership and systems thinking	Day 2—Pieces of the pandemic puzzle—system thinking
		Day 5—Synthesis—putting the pieces of the pandemic puzzle together
	6. Collaboration and partnerships	Not taught in isolation but woven throughout the course
	7. Communication, culture and advocacy	Day 4—Behaviour and communication and Communicating with the Press
Performance and achievement	9. Professional development and *reflective* ethical practice	Reflection time provided after every session.
		Daily reflective Vlog uploaded as part of Assessment Task 1
		Written Meta-reflection to be submitted at completion of course as part of Assessment Task 1

4.1 | Relations and interactions—Collaboration, partnerships and systems thinking

In designing the postgraduate course, Public Health in Pandemics, it became clear early in planning the course, that no one single lecturer would be able to deliver the breadth of course content. The course would need to involve multiple different experts from different fields to authentically deliver the course curriculum and to model collaboration and partnerships. Simply using multiple "guest lecturers" could create a fragmented learning experience for students. The use of guest speakers and or guest lecturers as a pedagogical device in higher education has been common practice across many discipline areas.[25,26] Typically, guest speakers are used to complement content and add real-world application of content. There have, however, been issues identified with the use of guest speakers/lecturers beyond budgetary and timetabling issues.[27] It has been suggested that guest lecturers need to be well versed in the course content, teaching and learning styles used in the course[28] to enhance the course. The course was intentionally designed to use a truly interdisciplinary, approach as described by Spelt et al.,[13] and to reflect authentic public health practice in complex systems, where relations and interactions are critical to successful outcomes. Feedback from students confirms we were successful in achieving this goal. Students indicated that they enjoyed the multiple disciplinary expert presenters, and this helped them understand how disciplines work together in practice for pandemic response. To ensure this process was seamless, the course coordinator met with every presenter prior to course implementation and discussed the focus of the individual presentation and outlined where it fit in overall narrative of the course. The course coordinator then reviewed each presentation prior to delivery to ensure the presentation fit the course curriculum plan. This approach was more time intensive in pre-course planning compared with more traditional course delivery yet was critical for its success.

Students reported that the use of the multiple presenters was coherent and assisted their understanding of needing to involve multiple stakeholders for pandemic responses at an individual and community level. Students who were in biomedically/clinically focused health professions, reported the course made them more aware of the need to communicate more broadly with various stakeholders, and to involve them in decision-making. For these biomedically focused students, there was a realisation that medicine alone was not going to effectively address the pandemic. This is particularly interesting as it has been long acknowledged that medical professionals tend to remain in their own disciplines[29] in best efforts to deliver quality patient-centred care, with a trend toward narrower specialisations,[30] not broader collaboration. There is growing concern within the medical profession of the complexities of modern health conditions and the impact of broader social, cultural and environmental determinants on individual-level health outcomes. The medical and clinical professions seem increasingly aware of the need to look not only sideward to allied health professionals to deliver optimal patient care, but also to cast their gaze upward to acknowledge the role and impact of social and systemic factors that enable and constrain their capability to care for their patients. Ultimately this shift in focus could result in more medical professionals advocating for system-level change to improve patient health outcomes.[31] There is encouraging evidence in our research to support this aspiration.

Regarding the use of systems-modelling software to explore pandemic response, students appeared to see the value and utility in its use. The focus group that was conducted in the middle of the intensive week found that students were still learning how to use the software and grappling with technical aspects. In some students' meta-reflections the utility of the approach once they had mastered the use of the software, was appreciated. This reinforces the calls in the academy to incorporate systems-thinking into health promotion courses in higher education[8,10,32] and provides some evidence on the effectiveness of this approach in assisting students to understand the complexity of health issues. Future course deliveries will need to consider if more time is needed for students to become more familiar with new software before being asked to apply it in class.

4.2 | Performance and achievement—Reflective practice

While reflective practice is a core competency for public health practitioners in the WHO-ASPHER[2] Framework and IUHPE competencies, it is omitted in the Australian CAPHIA Foundation Competencies for Public Health Graduates in Australia.[6,33–35] Despite this omission, scholars advocate for the inclusion of reflection and critical reflection in public health and health promotion degrees as critical reflection "presents a challenge to traditional health promotion approaches that are underpinned by biomedical and behavioural health discourses"[33] (p. 217) and can have a significant impact in challenging assumptions and analysing power relations[36] to address social justice and equity issues that continue to proliferate health issues.

The intentional use of multiple opportunities for reflection during the intensive teaching week was well received by students. When designing the course, reflection was explicitly built into the week-long program, as it was considered necessary to give students time to process the volume of complex information being presented over a short period of time and connect to prior learning.[37] Informal opportunities reflect were linked to daily Vlog reflection assessments, which contributed to a final written meta reflection. This ensured that students took the reflection seriously, as Brown[38] reminds us, students may avoid learning experiences that we provide in higher education, but they cannot avoid assessment. However, it has been noted that "reflection in assessment tasks with little or no pedagogical scaffolding generally results in superficial reflections that have virtually no impact on learning or future practice"[19] (p. 144). To avoid this, Kolb's[20] framework was utilised, to scaffold students through their reflections—by intentionally directing students to think about how their learning would link to current or future practice. Reflection is also included in the IUHPE Competency Framework[5] in supporting the development of ethical and professional health promotion practitioners yet can be difficult to embed authentically into course design and associated assessment,[39] due to

the tendency for students to tell us what they think we want to hear in "superficial descriptions of events"[40] (p. 159) rather than deep, authentic and critical reflection. Reflecting on own behaviour and practice while identifying attitudes, values, beliefs and where improvements should be made encourages the development of thoughtful, evidence-informed health promotion practitioners.[5,41,42]

4.3 | Content and context—Science, health promotion; law, politics, ethics and one health

This course provided the perfect opportunity to incorporate all the elements of the WHO-ASPHER Competencies Framework[2] Content and Context domain. Traditionally, Higher Education courses in public health might address these individual elements in separate courses. Piecing them together and not marginalising one or another was a challenge, along with achieving this in an integrated, seamless way. In the development of this course, it was considered important to embed health promotion as one of the key disciplines involved in pandemic response, and to highlight that health promotion practitioners, alongside others, need to work closely together. There is evidence from discussion with students that it is possible to effectively 'defrost" old, siloed teaching paradigms (Yassi[43]; p. 46). The Public Health in Pandemics course is one example of how to design a course that is guided by competency frameworks which can support student learning of complex public health issues, and importantly understand that no one discipline is responsible for effective outcomes. It is perhaps ironic that the global COVID-19 pandemic may have been the impetus for positive pedagogical change in health promotion and public health education that has long been desired. Ultimately, the teaching team is cautiously confident, that the interdisciplinary approach reflected and modelled best practice approaches in contemporary public health and health promotion that included more holistic/ecological approaches.[41]

4.4 | Recommendations

The findings from this small research project support the use Competency Frameworks to inform course design. Competency frameworks are comprehensive, developed by experts, to ensure that if competencies are covered in curriculum, it ensures graduates can meet industry needs. In Australia, it is a voluntary process for education institutions to become accredited using health promotion and public health competency frameworks, whereas for many other health professional training it is mandatory. To ensure graduates are contemporary, effective and recognised health promotion and public health practitioners it is recommended accreditation is strongly considered for these health professional disciplines. The perceived success of the interdisciplinary approach taken has been the impetus for discussions about the formation of teaching teams to deliver courses moving forward. Involving the number of "experts" as was done with this course may well be difficult to sustain given the extent of pre-planning and careful oversight by the course coordinator and implications for already time poor academics. However, the recognition of the complexity of contemporary health issues and the need for interdisciplinary approaches to address them has inspired conversations and a desire to move to collaborative teaching in smaller "expert" teams to co-course coordinate and deliver curriculum, moving beyond old approaches of incorporating guest lecturers.

4.5 | Strengths and limitations

The low response rate is a clear limitation of this study and the associated broader applicability of the findings. Asking students for their opinions of the pedagogical approaches taken in this course may have limitations as students may only be able to perceive the course being delivered this way, even though students were asked their experience compared with other courses undertaken. Additionally, while students could see the utility of interdisciplinary approaches for pandemic responses, it is not clear whether students see the value of interdisciplinary approaches in public health practice more broadly. There may also be an element of participant bias in both the focus group interviews and, in the survey, with only engaged students who were happy with the course agreeing to participate. Additional limitation of this study is the timing of the focus group interviews while the course was being undertaken. The absence of feedback of students on the course in the previous year drove a desire to capture students while we had their attention during the delivery of the course itself. Therefore, future research evaluating students' perceptions of courses, should consider the timing of evaluation and student burden.[39]

5 | CONCLUSIONS

Based upon the findings of this small study, the teaching team are cautiously optimistic that the interdisciplinary course "Public Health in Pandemics," designed using the WHO-ASPHER Competency Framework for the Public Health Workforce (WHO[2]), based on systems thinking and incorporating multiple opportunities for students to reflect, did assist students in understanding the complex nature of contemporary health promotion and public health practice. The teaching team are confident that the course was truly interdisciplinary and not a continuation of previous siloed approaches, that presented a cohesive story of pandemics and pandemic management. The teaching team acknowledge this approach did require more time in pre-course planning and liaising with multiple co-presenters, but from our students' perspectives, it enriched their learning experience.

ACKNOWLEDGEMENT

This research project took place on The University of Queensland's Herston Campus. Open access publishing facilitated by The University of Queensland, as part of the Wiley - The University of Queensland agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

Funding for the initial curriculum development of this course in 2020 was provided by the Faculty of Medicine, University of Queensland.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

Ethics approval for this research was granted by the University of Queensland, Faculty of Medicine Human Research Low or Negligible Risk Committee—approval number: 2021/HE002599.

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ENDNOTES

* In this article the term "course" refers to a subject and "program" refers to degree program.

† "One Health" is an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes."[15]

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How to cite this article: Shelley K, Osborne NJ, Reid S, Willemsen A, Lawler S. Student reflections on an interdisciplinary pandemics course utilising systems thinking. Health Promot J Austral. 2022;33(S1):87–97. https://doi.org/10.1002/hpja.646