Blurring disciplinary boundaries in the design studio:
Bringing architecture, business, and arts students together to prototype new solutions for palliative care

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Abstract

As complex global problems increasingly require the knowledge and skills of a broad array of disciplines, existing pedagogical approaches need to shift to support graduates to develop the skills necessary for innovation. This article reports on an experimental design studio that asked students from the disciplines of architecture, business and arts to work collaboratively to propose innovative solutions to complex real-world problems. While bringing other disciplines into the design studio is not new, in previously reported examples students were provided well defined parameters for assessment tasks, alongside clear expectations for how disciplines should work together. The studio reported here provided students with the agency to define their own artefacts in response to the problems facing palliative care, and to decide how they would work together in the process of that production. Within this context, students were forced to examine their own disciplinary limitations and to find strategies for working beyond those, and in doing so, move beyond the recognized limitations of inter- and multi-disciplinary approaches to problem solving. To understand the value of this learning experience, extensive data were gathered from students in addition to educator observations. This article provides advice for design educators wanting to augment the studio learning environment through transdisciplinary collaboration, as well as those beyond the design disciplines who may be interested in utilizing this learning approach.

Keywords: design thinking, epistemic fluency, productive failure, transdisciplinary, interdisciplinary, innovation

Introduction

The increasing interest of contemporary design education, including its adoption within other professional fields such as business and management, is in the capacity of design 'to grapple with meaningful social change' (Hunt 2012: 6). This raises a fundamental challenge, as Bjögvinsson et al. (2012: 102) have observed, in how to move from teaching students to design 'things' (objects,

buildings, products) to designing 'Things' (socio-material assemblies). This shift, as Dion Tuckwell (2017: 139) writes, is necessary for 'maintaining the transformational promise of design' and achieving innovation as design's ultimate goal. Yet, innovation in the face of increasingly complex global challenges is no simple task. Across the fields of architecture, business, and higher education, theorists agree that professionals who are willing to blur the boundaries of their own disciplines, by incorporating the knowledge and techniques of others, will be best placed to respond to increasingly complex global challenges (Markauskaite and Goodyear 2016; Noordegraaf 2011; Rodgers and Bremner 2013; Wrigley and Mosely 2022).

Palliative care is one of these challenges, presenting a problem that, as Stevens and Knoblauch poetically observed, 'implicates architecture in complications that it alone cannot solve' (2021: unpaginated). As one of many medical specialities already under pressure from an ageing population with increased comorbidity, workforce shortages, and a declining tax base to fund public investment, COVID-19 has exacerbated and made more visible these challenges (Etkind et al. 2020). This article reports an elective unit of study, known as 'the transdisciplinary studio,' that bought together students from the disciplines of architecture, arts, and business to work together in proposing innovative solutions to the challenges facing palliative care within Australia. This experimental unit of study followed two semesters of working with architecture students, alongside a multi-disciplinary group of stakeholders, to examine and propose solutions to the challenges of healthcare delivery and the spaces in which that delivery takes place (McLaughlan et al, 2021). The transdisciplinary studio, like its predecessors, was developed to explore what was possible if architects could work alongside other disciplines to enact social and political agendas in response to real world challenges. The studio sought to go beyond the spaces in which healthcare is delivered to address important issues around healthcare access and engagement. Palliative care provided the kind of ill-defined problem that Basarab Nicolescu

(2014: 19) suggests requires transdisciplinary thinking, being 'at once *between* the disciplines, *across* the different disciplines, and *beyond* all disciplines.'

Interrogating the relationship of multidisciplinary to transdisciplinary approaches to problem-solving, Blevis and Stolterman (2009: 4) suggest that the latter goes beyond bringing researchers from different disciplines together to work towards a common goal while continuing to use their own theories, tools, and methods. And where the purpose of this *going beyond*, is to shift the focus from particular methods and domains of expertise, to a 'value orientated' approach, that is, methods and expertise are deployed only as and where required in the pursuit of a broader goal (or project). Transdisciplinarity has in this way been defined as 'value orientated approach to design,' suggesting that an individual might be considered transdisciplinary where they bring a broader perspective to their work (Blevis and Stolterman 2009: 5). Moreno and Villalba (2018: 45) alternatively discuss transdisciplinarity as something which must involve multiple collaborators and that 'implies a higher level of interaction between the disciplines involved.' As James Hunt (2012:7) has stated 'designers cannot go it alone when navigating [complex] issues in public health or disaster relief.' While the transdisciplinary studio was interested in the agency of the designer to effect change, it was more interested in what was possible when multiple disciplines acted together in *designerly* ways, in this case, to benefit the field of palliative care (Yuille et al. 2015). Our approach is in keeping with that proposed by Lucy Kimbell (2009), who suggests that 'design thinking' – and here the authors' include the aim of teaching it – should be replaced with 'designedly ways of knowing' that are only learnable through 'the making and doing' that is part of the design process (also see Tuckwell 2017). This article draws on extensive data gathered during the transdisciplinary studio to assess the benefits of transdisciplinary learning for enabling students to learn the skills necessary for innovation, including communication and collaboration across disciplines; alongside an awareness of the limitations of disciplinary habits, and the ability to integrate the tools of other disciplines in response to those limitations.

Background

While the design studio has long been the place where designerly ways of working are learnt, this pedagogical space also encompasses much that scholars of innovation and epistemic fluency celebrate. It uses project-based learning to enable students to learn for-, through-, and about- design; follows a cognitive apprenticeship model where students can observe how their teachers and peers approach problem solving; and enables learning from experimentation encouraging rapid prototyping and 'productive failure' (Edelson 2002; Kapur 2015; McLaughlan and Lodge 2019; McLaughlan et al 2021). The potential of the design studio for peer learning has led several educators to experiment with bringing other disciplines into the design studio. The example referenced in the pedagogical design of the transdisciplinary studio came from Johns Hopkins University, where Ungaretti et al. (2009) bought together students from marketing, environmental design, and graphic design to produce a marketing strategy for an industry partner. Reported learning benefits included developing an appreciation of the value of teamwork, tailoring communication for different audiences, and learning to work with research methods from other disciplines. In a more recent Australian example, students from architecture, landscape design and nursing were bought together to create a guideline for the design of refuges for women and children escaping domestic violence (Donnelly et al 2019). In both examples, students were provided with well-defined parameters for assessment tasks, and a clear set of expectations for how the three disciplines should work together. In the latter, nursing students briefed architecture and landscape design students about end-user needs relative to this building type. Yet recent ethnographies of interdisciplinary research have shown that assumptions about how disciplines *should* work together can limit the potential of these collaborations; and that having an open (or ill-defined) versus a fixed research problem – where the former allows refinement of that problem through

collaboration and negotiation – can lead to richer results (Cains et al. 2020). This also resonates with Perkin's (2010) observation that authentic learning experiences must allow students to 'play the whole game' instead of learning separate elements in isolation (also see Yuille et al, 2015: 120). Our interest was to understand what was possible if students were allowed to determine how they wanted to work together and what artefact warranted production in the context of the challenges facing palliative care.

The dual interest of the transdisciplinary studio in creating artefacts capable of having an impact within the world beyond the classroom recognises the 'performative potential' of artefacts created through critical design (Yuille et al, 2015: 121; DiSalvo, 2009; Dunne and Raby, 2001). A central hypothesis underpinning the studio was that transdisciplinary teams could employ a broader set of skills and knowledge in relation to these problems, making it possible to implement or prototype them. What distinguishes innovation from creativity, as Rosing, Frese and Bausch have written, is 'its implementation […] as opposed to the mere generation, of ideas' (2011: 956). While students were given agency to define their own artefact for assessment, a range of world-ready artefacts was anticipated by the educators; perhaps a prototype for a health care app, an exhibition or short documentary, a podcast, or the tentative first steps toward a proposal for health policy reform. Simultaneously, through this design research process, it was anticipated that students would be provided valuable opportunities to work through the kinds of conflicts that arise within complex projects where stakeholders bring different ways of seeing, valuing, and generating knowledge (Cains et al 2020; Weingart and Stehr 2000).

Our approach responded directly to Markauskaite and Goodyear's concept of 'epistemic fluency' which suggests that, to best assist the development of skills for innovation, teachers should provide students with the agency to determine their own learning activities and outcomes, providing them with opportunities 'both to engage in their learning and inquiry activities *and* monitor and adjust their

working methods' (2016: 607). They suggest this approach can assist graduates to develop 'a sense of how to reconfigure the world in order to see what matters more clearly and enable oneself, and others, to act more knowledgably' (2016: 20; also see McLaughlan and Lodge, 2019). This also responded to Hunt's (2012: 6) rallying call, that if 'designers are no longer shaping objects, buildings, and letterforms but processes of innovation and change, the rules of the game and the terms of engagement must evolve as well.'

Pedagogical design: Planning for agility in response to the emergent learning needs of students

In providing recommendations for how teachers can help develop the skills for epistemic fluency, Markauskaite and Goodyear recommend that the teacher's role should focus on designing tasks that allow students the latitude to 'adjust their working methods and working environment' (2016: 607). This suggests a flexible structure that anticipates ongoing change, on the part of teachers, in response to the emergent learning needs of students. This section will outline the key details of this experimental studio and elucidate how the approach to teaching, resourcing and assessment was adjusted in response these needs, as they surfaced and materialised through the artefacts proposed and produced.

The transdisciplinary studio was run as an elective unit of study, open to students across specific post-graduate programmes of study within the disciplines of architecture, business, and arts, to achieve a complimentary mix of skills across each team.[1] While the teaching team initially hoped to include students from medicine, anthropology, and sociology, the organisational constraints of those degree structures precluded doing so. Sixteen students applied for the transdisciplinary studio, and all were accepted: five from arts, five from architecture, and five from business, while the sixteenth student was enrolled in an arts degree but had previously completed a business degree. Twelve students

completed all twelve-weeks of this unit of study. Three business students withdrew following week four, and a fourth at week six.

The transdisciplinary studio had two contact sessions per week, each two-hours long, and was structured into three phases (Fig. 1). The first was a four-week *orientation phase* that included the guest lectures and core readings to familiarise students with the challenges facing palliative care, alongside two rapid-fire team design tasks (5% each). A two-week *project scoping phase* followed where students worked independently to identify a specific problem facing palliative care and propose a suitable artefact to address that problem (30%). This assessment was used to formulate the project briefs for the third project phase. Phase three was the *transdisciplinary team collaborative project phase* where teams worked on the implementation of the brief they were given (50%). The final assessment task was an independent learning reflection (10%). The purpose of the rapid-fire design tasks was to familiarise non-design students with the routines and expectations of a studio, including opportunities to practise collaboration and design thinking. The scoping phase was intended to cast a wide net in terms of the challenges facing palliative care and the artefacts proposed in response. Following these individual presentations, students and guest critics were asked to rank their six preferred proposals, with the intent that transdisciplinary teams would then implement (or prototype) one of those proposals. Decisions on team membership and the proposals given to each team were randomly generated but no individual was given back their original idea to work with. This was to circumvent issues of 'idea ownership' within a team that could establish an artificial hierarchy of leadership and disrupt collaboration. Students were given the choice of working in groups of three or four (with smaller groups able to implement four ideas over three). Students elected to work in groups of four but asked that each group be allocated two ideas from the top six, and to be allowed to select the one that resonated best with their team, or to redefine the project scope to incorporate complimentary elements from each proposal.

Replicating the strength of the prior (architecture) studios, thirteen guest collaborators volunteered their time, providing a mix of short lectures, and/or project feedback during informal workshop sessions, alongside formal presentations, known within architecture studios as "crits" (McLaughlan and Lodge 2019). Guests included a palliative care physician, music therapist, psychiatrist, anthropologist, the Director of Innovation at a large private hospital, the CEO of a children's hospice, two medical researchers, a gallery curator, an industrial designer, a psychologist specialising in paediatric palliative care, and two Strategy Designers. While the first six in the list above were engaged at the project outset, the remaining seven contributors were invited during the semester in response to the varying needs of the student projects.

The teaching team consisted of two architectural educators, one with practical experience in the design of palliative care facilities and the other with research expertise in this area. The pedagogical design was adapted from another studio model iteratively refined by the educators, but taught to architecture students, in the two years' prior to the transdisciplinary studio (McLaughlan and Lodge, 2019; McLaughlan et al, 2021). Educators from the disciplines of arts and business were consulted on the suitability of adapting this studio model and whether further changes were necessary. While no changes were suggested, it was originally anticipated that these same educators would maintain a close engagement with the course throughout the semester, able to identify and implement opportunities for change. Unforeseen organisational constraints precluded this level of engagement and to rectify this a third educator was engaged at week four to diversify the teaching team. The third educator brought experience from a recent Masters of Entrepreneurship and practical experience from the film industry. This recruitment was in response to the learning needs of the students when it became clear (through the first two assessment tasks) that the business students held a more linear understanding of what design was, and how it should be employed as a tool. These expectations conflicted with the

pedagogical design and resulted in the business students lacking confidence in the architectural educators. A few of the business students were vocal about this and it consequently disrupted rapport building between the architectural educators, the business students and, by extension, the wider cohort. Incorporating expertise from entrepreneurship, including the third educator, alongside three additional guest lectures from practitioners of industrial and strategy design, rectified this situation and placed the learning process back on track.

Another key shift in pedagogy, made in response to student needs, followed the project scoping phase. The nature of the artefacts proposed required a significant shift in our expectations for the studio that included relinquishing the aspiration of generating artefacts that could be immediately placed within the world. For an artefact to realise its performative potential requires the implementation / production (or advanced prototype) of that artefact, yet only two of the projects voted into the top six were suitable for this purpose. The first was a series of pop-up information kiosks about palliative care and the second was the optimisation of an existing event, known as 'Death over Dinner', with a social media campaign. Both were aimed at increasing the public's understanding of palliative care. The remaining four proposals included a gaming app to facilitate advanced care planning for patients with early onset dementia and young families; using virtual reality to provide psychological respite for the siblings of paediatric palliative care patients; a social media campaign to increase rates of compassionate release for prisoners requiring palliative care; and the delivery of end-of-life care within a modified Air BNB model (combining temporary accommodation with an integrated healthcare service as an alternative to dying in hospital, or in the family home). The major assessment was subsequently adjusted, instead of an actual prototype, students were asked to deliver a comprehensive strategy for the implementation of their idea. This included an oral pitch supported by a written application, directed to a funding body that each group identified as appropriate to the aims of their proposal (such as philanthropic funding programmes or engaging an industry investor). This required students to concurrently refine their idea

while completing a series of tasks required to make a funding application. This varied for each group but typically included the preparation of an evidence-based justification, market / competitor analyses, budgets, project delivery plans, and establishing team roles and/or company structures.

Collecting data to understand the student experience of the transdisciplinary studio

Qualitative data was collected from students using surveys, interviews, ethnographic observations, and educator field notes. Surveys were administered to thirteen students at week six (response rate = 85%) and twelve students at week eleven (response rate = 83%). Survey competition was voluntary and anonymous, and completed by a research assistant (RA) instead of the teaching team. Non-covert observations were undertaken by a second RA. These began in week three of semester, coinciding with the first assessment, were recorded in the form of field notes, and were not shared with the educators until three months following the semester's completion. Reflective field notes were also kept by the lead educator (author one). All students were invited to complete an interview following completion of the transdisciplinary studio with the same RAs. Three students completed interviews (one from arts, one from architecture, and one from business). Views of one student who withdrew were captured in the survey administered at week six, and another in the post-semester interviews. Views from other students who withdrew were also captured within opinions expressed during class and recorded in the field notes. Students were informed prior to enrolment that data would be collected throughout the transdisciplinary studio but that individual participation within these processes would be voluntary (ethics was granted by the University of Melbourne). Artefacts have also been included as part of this data set, since these "materialize and surface the intangible, experiential knowledge created during projects" (Yuille et al, 2015: 121). Artefacts can often reveal learning benefits beyond what the students themselves are immediately perceive, particularly within challenging learning experiences

where a deeper appreciation of what was learnt may require further time for reflection (McLaughlan and Chatterjee, 2020).

Overcoming the obstacles to success: The transition from ambitious disregard to attentive awareness

All four of the proposals voted into the top six that were impractical for implementation were conceived of by architecture students. While there was a blue-sky hopefulness about each of these schemes, they evidenced an almost complete disregard for time left available, the limitations of the expertise within the class, and the fact that no funds were available to implement proposals on such a large scale. This proved to be a significant frustration for the business students, as one who withdrew from the transdisciplinary studio explained:

> I would love to do research that comes up with something that you would use [...] but I felt like we were instead being pushed to be really creative – and I don't think any of the [architecture students'] ideas were actually feasible.

All three teams were forced to confront the limitations of the projects they were given and to find ways of overcoming those limitations. Even the team briefed with the two most feasible ideas – the portable information booth and the 'Death over Dinner' proposal – in working through the delivery of these ideas concluded there was a better way to increase public awareness of palliative care. This team eventually pitched a fundraising campaign for a nearby children's hospice. Identifying a dual need for funding and public education, they proposed partnering with local cafes to supply custom-designed disposable coffee cups in return for a portion of the coffee sales for donation to the hospice. The cups would be co-designed between hospice patients and an artist-in-residence (a programme created for the campaign) and include a QR code that would link to an Instagram site sharing content

about the hospice, paediatric palliative care, and the artist's work with children. To provide a deeper understanding of continual negotiations and readjustments that students undertook within the process of refining their proposals, this section will report the most extreme of the three projects as a case study.

The project known as 'the compassionate release project' was inspired by two of the studio's guest collaborators – a professor of anthropology and a medical researcher – who both spoke of the experience of facing death while incarcerated. Students learned that some patients declined palliative care within prison because this required transfer from a low-security to a high-security environment (where the hospital unit was located). In refusing care, these prisoners were often, inadvertently, also declining the medications necessary for effective pain relief in the final stages of life since certain medications cannot be administered beyond the hospital unit (Panozzo et al. 2020). The architecture student who proposed this project agreed that palliative care should be a basic human right. Since the prison environment appeared to be the greatest obstacle to receiving appropriate palliative care, she argued for the greater utilisation of medical parole laws that enable compassionate release on the grounds of terminal illness (New South Wales State Government, 1999). Drawing inspiration from Brandon Stanton's 'Humans of New York' Instagram page (@humansofny), this student proposed a social media campaign to generate public support (through compassion) for the greater utilisation of medical parole.

The team briefed to strategize the implementation of the compassionate release project were simultaneously inspired and incredulous. While inmates convicted of murder, first-degree manslaughter, or sexual offences, cannot be considered for compassionate release, this did little to reduce the controversial nature of this proposal. The team recognised that public resistance could be insurmountable. They began by asking a question they'd learnt from another guest collaborator (a

business strategist), 'what would success look like in the context of this project?' Early discussions centred around what was possible. An architecture student remarked 'we can't just establish a policy, that takes about ten years. Also, we're not lawyers.' Through discussion, the team concluded that they wouldn't need to develop a policy, or to necessarily lobby government for change, but they could still make an impact. Their first decision was that their campaign would comprise ten short-format documentary films for release via social media.

The act of lodging a grant application forces several inter-related decisions. To generate a budget, for example, required the team to decide on film length, content, and distribution platforms. Led by the architecture students, whose default response seemed to be solving problems by brainstorming alternatives, the team initially tried to discuss their way through this. The entrepreneurship educator intervened, reminding them of the need to: 'build-measure-create, don't get stuck in debate.' This prompted the team to create a small online survey, distributed on campus, to gauge likely receptivity to their cause and identify what the basis of negative opinion toward it might be. The survey also asked what kinds of social media students were using, to provide evidence for which platforms the campaign should target. Within the earlier (orientation) exercises, one of the business students expressed a lack of confidence in project outcomes because they felt the architecture students tended to 'rely [on research] from websites, not academic resources and surveys.' The utilisation of a survey thus illustrates the students' developing awareness of the value of relevant knowledge to guide project development – in lieu of relying on assumptions – and of a greater range of tools for obtaining targeted knowledge relative to previously untested ideas.

The compassionate release project presented myriad challenges. Difficulties related to filming itself, for example, included gaining access to prison sites and overcoming power-relations between filmmakers and the individual prisoners whose stories would ultimately determine the campaign's

success. The team trawled media releases related to Australia's prisons to identify a facility that had previously supported a film project on juvenile detention, reasoning that this facility might be amenable to participation and identifying them as a possible project partner. They read up on ethnographic approaches to interviewing vulnerable populations, and on the strict protocols for establishing contact with a prisoner. This knowledge fed directly into the project timeline and budget which was adjusted to fund multiple interviews with each participant, justified as necessary 'to gain [their] trust,' and to obtain sufficient quality footage for the fifteen-minute documentaries. The team identified that a public backlash would need to be carefully managed, and that causing undue distress to victims and their families would not only be unethical but would fuel public hostility to the project. The proposal was adjusted to include resources for engaging the victims and families of the individual prisoners selected for participation, to provide them the opportunity to object, or to censor certain details that could cause further distress.

These practical challenges were, of course, far easier to address than affecting a shift in public opinion. The on-campus survey, even with its liberal demographic, found that only forty per cent of respondents 'believed that dying prisoners deserve access to higher quality care.' Multiple approaches were explored for shifting public opinion, including whether the economic issue of overcrowding within Australian prisons could be leveraged to mobilise support for compassionate release. Or if thematic art exhibitions, like 'Art AIDS America' (Bronx Museum 2016), could be used to reshape public perceptions. The intent originally defined by the team, in response to the brief they received, was to create 'a social media campaign as a trigger to achieving advocacy for compassionate release.' As the team's understanding of the project's challenges deepened, they became increasingly aware that, in its existing form, this project was unlikely to succeed. The following excerpt, from a class conversation, documents the team's realisation that their project needed to evolve:

Student 1:   On Monday we decided to change content in response to feedback.

Educator 1:   So, what are you proposing now? A full-length documentary?

Student 1:   Unsure, it's still developing, but something about conveying prisoners' experiences, e.g. stories.

Student 2 then shared the research he'd undertaken on social media campaign precedents; which change.org campaigns were the most successful and why; and how organisations such as Amnesty International and Human Rights Watch were harnessing social media to further the aims of their organisations.

Educator 2:   Have you looked at the exact procedural steps to make this happen?

Student 1:   No, we're just focusing on [understanding] how to place pressure, how to gain traction via a social media campaign.

Student 3 then shared her discovery of a volunteer palliative care programme, staffed by inmates, that had been successfully running at the Louisiana State Prison (USA) since 1998.

By the following week, the project had transformed. In the conversation below, the team's leader is explaining the refined proposal to two of the studio's guest collaborators (both medical researchers in the field of palliative care), who had joined the class for the interdisciplinary guest workshops (these were held at weeks 9 and 11 to assist students in the refinement of their projects):

Student 01:   It'll be one documentary [screened at the Humans Rights Film Festival] but released on Instagram in little snippets, each one-minute long, alongside photos and quotes to build anticipation of the release of the mini-snippets. This, in turn, will build anticipation of the full documentary.

Educator 01:   How does Instagram make change?

Student 01:   It builds interest. From that platform you go to the [campaign] website and sign a petition [in support of] improved access to palliative care within prison.

Educator 01:   You've pivoted a bit?

Student 01:   Yeah, improving access may be better than compassionate release –this is less problematic to pitch from a public relations perspective.

Guest 01:	So, the documentary would track where the gaps are, where the need is, perceptions of prisoners?
Student 01:	We initially thought to document the prisoner's story, what kind of care they received. Now the documentary will be less about one person's journey, but about different stories stitched together.
Guest 01:	So, there would be a story around things they could and couldn't access [relative to palliative care], with resources?
Student 01:	Yes, and also about creating faces, people the public can connect to.
Guest 02:	So, what is the solution you're proposing via the documentary? There's no one you could interview about a solution because the solution doesn't exist here yet. Maybe talk to a doctor [in the documentary] …Think of incorporating existing healthcare professionals who are involved in the services that *are* available right now, so we can articulate what needs to be done and how. Translate awareness as a call to action.

What this team pitched in the end was using the 'power of documentary film' to raise awareness and exert pressure (via a change.org campaign) on state governments to implement better palliative care in prisons through a prisoner volunteer system. The proposal identified that between 60,000 – 100,000 signatures would be required to effect change and costed the twelve-month campaign delivery at campaign at $70,000 (including content creation). A mix of funding streams were proposed including community and government arts funding, philanthropic grants, and crowdfunding. The compassionate release project elucidates the shift from ambitious disregard to a more attentive awareness of real-world constraints that all three teams moved through in the process of strategizing the implementation of their proposals. These projects provided a vehicle for learning that new tools, alongside different ways of framing problems and communicating ideas, were necessary to navigate the obstacles that arose within such complex, real-world projects.

Blurring disciplinary boundaries and the benefits of *un-learning*

Finding ways to manage the ambiguity of an open design research processes was the ultimate, and intentional, challenge of the transdisciplinary studio. As Rodgers and Bremner (2013: 157) have observed, the nature of contemporary global challenges mean that graduates will increasingly find themselves expected to 'work confidently within a state of not-knowing.' Despite the steps taken to enculturate the other disciplines into the studio learning environment, stark differences were apparent in the level of comfort felt by the various disciplinary cohorts in managing ambiguity. This presented no difficulty for the architecture students who remarked that this process was 'pretty standard [...] our whole degree, there's not much clarity in it, we rarely get criteria sheets.' Indeed, many appeared to thrive when faced with multiple speakers and perspectives, as another reflected, 'the larger the body of information we had to work with, the more innovative our responses became to increasingly complex problems.' This was more challenging for the students from business; a discipline that, as Yuille et al (2015: 118) have observed, tends to perceive design as a tool for solving problems, where 'design has a job to do, and that job is best accomplished by designing things to be as unambiguous as possible.' Students from arts and business recounted initially struggling to understand what was expected of them, and how to define tasks and deliverables within such an open brief. While the first two assessments were intended as low-stakes opportunities for other disciplines to become comfortable within the studio environment, assisted through peer-mentorship from the architecture students, the business cohort reported feeling 'pressured' by the five per cent weighting accorded to these tasks. The pedagogical design did not account for the fact that business students are taught never to show up to a presentation unless they have something 'polished and professional' to share (as the architectural educators lacked this awareness); or that, for these students, low stakes was not a valid concept. A five percent assessment that included group format and unfamiliar ways of working, instead, represented a threat to the otherwise high GPAs of the business cohort. Adding

to these frustrations were a set of preconceptions about what design was, how it should be executed as a process, and what their role within that process should be:

> I think most of us thought the assignments would be tailored for the students from architecture to maybe design a product, and then we would be looking at how to market it, or at budgets […] we would support them through the realisation of their ideas.

It's fair to acknowledge that, initially, the architectural educators also assumed this would be a likely outcome of this studio. Particularly as this was not dissimilar to the findings reported by Ungaretti et al in their pilot studio of 2009. Nonetheless, the pedagogical approach had been deliberately designed to allow other, less predictable things to happen. What the educators witnessed, as intimated within the case study of the compassionate release project, was a far more sophisticated learning process where students developed new understandings that made obvious the limitations of their own disciplinary practices, and subsequently un-learnt those by adopting better methods of working. This is exactly the kind of blurring of disciplinary boundaries that transdisciplinary problem solving aspires to.

Clear communication is a cornerstone of successful collaboration. The practice of transdisciplinary collaboration revealed to students that words have nuanced disciplinary definitions, leading team members to interpret them differently, and that it is also possible to be talking about the same idea but not realise because the language being used is so different. Communicating successfully across these boundaries meant acquiring new communication strategies, or un-leaning habits previously acquired through their studies. One student recounted her experience within the first exercise, when she tried to explain her idea to teammates from arts and business:

> First, I said, 'it's about the narrative' and they had no idea what I was talking about. So, I said, 'it's about notions of comfort and home,' and they still had no idea what I was talking about. Then I realised, 'okay, I'm going to need a drawing or a model to succeed in communicating this.'

Working within transdisciplinary teams forced students to examine and adjust their communication styles. Architecture students came to understand the uniqueness, and thus value, of their graphic communication skills but also the need to present information in a way that non-architects could understand. Another commented that 'a more practical approach means that I'll be able to communicate my designs [to] reach a larger audience.' The most sophisticated reflection regarding the communication skills facilitated through this learning process came from an arts student who said:

> I discovered that the architecture students were more interested in research articles that could help formulate a design rationale. I observed that business students were more responsive to ideas with clear feasibility. Consequently, I learned the importance of tailoring the content [you're sharing] to everyone, even within your own team.

Students reflected on the value of having multi-disciplinary expertise within the team, enabling them to talk through problems and identify the gaps within each other's arguments. Beyond the value of multiple perspectives for revealing where key decisions rested on the assumptions of one team member, students also confirmed the value of learning – from their peers – about how other disciplines approached problem solving. As one arts student reflected:

> What I loved the most about the transdisciplinary studio was learning from others […] not just what we learned from the guest collaborators, but in terms of seeing how architecture students worked through the brief, and how the marketing students worked through those exercises. It was it was a chance to see different ways of thinking about problems.

Importantly, this enabled students to recognise where accepting their own business-as-usual approach limited their progress, and the necessity of adopting tools from other disciplines to overcome this. As Savransky and Rosengarten (2016) have pointed out, the habits of disciplinary practice determine what kinds of solutions are able to be seen in response to a problem, and those

that will remain unseen. The starkest contrasts in problem solving occurred between the architecture and business students. The architects were willing to jump immediately into a design solution despite myriad unknowns, and to allow the emergent project to guide the process of knowledge accumulation and learning. Yet weaknesses exist in an approach that too often privileges impassioned persuasion over evidence; and relies on assumptions about the universality of human experience in lieu of obtaining a comprehensive understanding of the end-user. Within the early orientation assessments, the business students offered several data-driven methods for enriching the design process, but it took several weeks for the architecture students several weeks to appreciate the value of these approaches. In the first assessment, when the business students questioned the architecture students about market research and scalability, they were told: 'this [task] is rapid fire, it's just about ideas. Kick your socks off [...] the sky's the limit.' Yet, in the completion of their final assessments, all three teams integrated a range of business tools, including market and competitor analyses, SWOT analyses and Business Model Canvas tools (as per Business Models Inc. 2018). This was consistent even for the team who didn't have a business student (owing to the number who'd withdrawn). An appreciation of what these tools can add to architectural practice was confirmed in the feedback from several architecture students, who communicated the importance of 'providing evidentiary support to an argument, not just [saying] *I feel* or *I believe*' when presenting a project to critics or stakeholders. As another student reflected, 'it's interesting that it took learning about other people's strengths and weaknesses to recognise your own.'

Similarly, the broad array of guest collaborators engaged with the studio consolidated the value of properly understanding one's client or end-user instead of assuming how an idea, product, design, or campaign will be received. Opportunities to interact with these guests enabled a sense of connection to the people for whom these projects were being proposed, in this case, children facing end-of-life, alongside their siblings, and those receiving palliative care whilst incarcerated. Importantly, these

insights enabled students to develop a greater sense of empathy that strengthened their commitment to these projects. One architecture student commented that it was 'super valuable to get that gritty information that you otherwise wouldn't find on the [inter]net etc [...] definitely helped enrich our understanding of those experiencing palliative care.' An arts student similarly reflected:

> It felt like we could tailor our projects to palliative care patients more when we got feedback from people who were actually in that industry. Especially in the [workshop] sessions [...] the child psychologist we spoke with understood the patients so well that they were able to look at our projects from their perspective.

Another student from that team remarked on the value of these conversations for understanding the 'realities and possibilities' of their project. Understanding project constrains was equally necessary in this process. The compassionate release project certainly captured this aspiration, as one team member reflected:

> this was a really confrontational issue [...] we had to work out what was going to be a palatable thing for society to get on board with [...] to work out how to be sensitive in what you're talking about, but also provocative in a sense, and emotional – there was a whole load of things that we had to juggle.

This quote also captures the interest of the transdisciplinary studio in providing students with opportunities to see where they have agency to make a difference, even where problems are so complex that they may initially appear impossible. As Harriet Harris has argued, higher education should encourage students to examine what 'they are good for,' suggesting it is this 'shift in power' that provides students with the agency required to imagine alternatives to traditional practice (2015: xiv).

What occurred through the transdisciplinary studio was not the kind of multidisciplinary problem solving that Blevis and Stolterman (2009) highlight the limitations of but a genuine blurring of disciplinary boundaries. Those students who completed the course moved beyond their disciplinary

attachments to methods and fields of expertise in search of those most appropriate to the task at hand. As an architecture student from the compassionate release project explained:

> Because we didn't have a business student [in our group], one of the arts students assumed that role, she was interested in the finance side of things and did the budget [...] the other arts student undertook a design [based] analysis of the elements of a documentary. My strength is writing so I did a lot of that. The other architecture student was really interested in the ethnographic side of things [...] Because we didn't really have elements that were architecture-focused or arts-focused, we looked at what we were individually interested in [...] and that's how we allocated tasks. [Interviewer (RA): Towards the end of the project were those disciplinary boundaries blurring?] Absolutely, yeah.

Conclusion

The transdisciplinary studio proved a successful model for moving beyond the recognised limitations of inter- and multidisciplinary approaches to problem solving, enabling an authentic transdisciplinary approach. Working together on a shared problem that was beyond the expertise domain of all three disciplines, enabled students to develop the skills to communicate and collaborate across disciplines, and the ability to integrate the tools of other disciplines in response to the needs of a project. The back-and-forth process of identifying constraints and iteratively reshaping projects in response to new knowledge, enabled students to understand how and where to direct their efforts for maximum impact. The shift from campaigning for the early release of prisoners to providing better palliative care within prisons offers just one example of this awareness in action. Across the architecture cohort, there occurred a clear shift from approaching complex problems with an initial disregard of real-world constraints to understanding the need to identify and respond to each limitation in turn. With this came an awareness of the limitations of disciplinary habits in responding to complex, real-world challenges. Providing opportunities to learn these skills are critical given that implementation

is the key ingredient in differentiating innovation from idea generation; design cannot effect change if does not result in some socio-material 'Thing' able to be put into the world.

Unlike the experimental studios run by Ungaretti et al (2009) and Donnelly et al (2019), the transdisciplinary studio took the deliberate approach of not narrowing the horizon of possibilities for students, in terms of the artefacts produced and the ways students might work together in the process of that production. This was an important distinction in extending opportunities for students to develop the skills of epistemic fluency and to apply those skills in designerly ways in respect of a complex, real-world problem. Yet the transdisciplinary studio was not without its limitations. While it did not seek architectural artefacts in response to the challenges facing palliative care, this unit of study could not escape being grounded in the discipline of architecture. It was led by architects, with a pedagogical design adapted from architecture and, thus, underpinned by architectural conceptions of what design is, how it operates and is practised. This disciplinary bias led to an initial over-reliance on architecture students to carry the burden of introducing the other disciplines, through peer-learning, to design practice. The subsequent incorporation of entrepreneurship and strategy design expertise into the studio exposed students to different design tools and frameworks that demystified the design process for non-architects. This proved a necessary bridge to understanding, offering various ways to start the design process, and for critically evaluating different design options. Moving quickly to bring additional expertise into the studio, alongside our willingness to alter assessment expectations – and, indeed, our own expectations for the studio in terms of outputs – provide key examples of the agility required from teachers within transdisciplinary learning environments.

Notes

[1] These programmes included the Master of Architecture (School of Architecture), Master of Management, Human Resources and Marketing majors (School of Business), and the Master of Arts and Cultural Management (School of Culture and Communication, Faculty of Arts).

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Phase 1: **Orientation phase** (weeks 1-4)

This included guest presentations, readings and (team) speculation exercises to encourage design thinking and practise making knowledge actionable.

1	**Seminar 01** Introduction to the studio from previous students (of the architecture studios)
	Seminar 02 Guests: Palliative Care Physician + Professor of Anthropology
2	**Seminar 03** Guest: Music Therapist
	Seminar 04 Guests: Psychiatrist + an Architect on the design of palliative care facilities
3	**Seminar 05** Guests: Industrial Designer + Director of Innovation, Private Hospital
	Assessment 1 Crit: Team Design Exercise (5%) *Rethinking the object:* chose a medical object (dialysis chair, morphine pump etc), and rethink its design for use within the home – think about the design adjustments you might make to alter the psychological response to this piece of equipment within the home and its ease of use. *Guest critics: Lecturer, Business School + Professor, Anthropology*
4	**Seminar 05** CEO, Children's Hospice + Palliative Care Researcher
	Assessment 2 Crit: Team Design Exercise (5%) *Location speculation*: propose a non-traditional co-location for a new 12-bed palliative care facility; what functions could we pair these facilities with or beside that are not conventional neighbours (perhaps a Fine Arts School or Zoo etc)? Graphically represent a SWOT analysis of this co-location. *Guest critics: Gallery Curator + Masters of Entrepreneurship Graduate*

Phase 2: **Project scoping phase** (weeks 5-6)

Students use this time to <u>individually</u> shape a project proposal, pitching what they see as most pressing problem to be addressed within the field and what type of solution could assist that (30%). *Students + Guest critics (including a Gallery Curator + Professor of Palliative Care + 2 Palliative Care Researchers) voted for the top 6 projects to take forward into phase 3.*

Phase 3: **Transdisciplinary team collaborative project phase** (weeks 7-12)

During this time students work <u>in teams</u> to strategize the implementation of their project; in addition to continuous feedback from course tutors, 2 workshops were held during this period (at week 9 & 11) with guests to provide interdisciplinary feedback on the proposals. New and existing guests were invited into the studio during this period, in direct response to the specific needs of the 3 team projects. *New guests included 2 Strategy Designers and a psychologist who specialised in paediatric palliative care.*

Final presentation at week 13 (50%).
Guest critics included: CEO, Children's Hospice + Professor, Anthropology + Physician, Palliative Care

Figure 1. Overview of the transdisciplinary studio