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Editorial
Design Education: Teaching in Crisis

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It is probably an obvious understatement to say that the past years have been turbulent and uncertain. The Covid-19 pandemic forced changes in many areas across all parts of society and its effects continue today and will undoubtedly do so for many years to come.

In education the impacts were significant. Design education is usually taught in a design studio setting and relies heavily on physically proximate and social mechanisms of learning and teaching. Changes to physical modes of teaching had to be made at speed, meaning the planning and preparation needed to successfully create learning materials was not always possible. Contingency teaching methods and material quickly appeared and, for many, responding and reacting, in what was effectively an emergency setting, became the reality of teaching (Winters, 2021).

There were exceptions, of course. Some institutions refused to abandon face to face methods: some on the basis of student expectation; others around beliefs about the purpose and politics of design education. Yet other institutions responded as they normally did, in the sense that emergency response teaching was already their way of working and the pandemic was another disruption requiring an emergent teaching response.

Like privilege, the effects of the pandemic have not been evenly distributed.

For many design educators the shock of losing physically proximate and synchronous access to students removed what turned out to be a huge and taken-for-granted structural component of design pedagogy. This was more than a loss of space to teach or place to design; for some institutions it affected all aspects of the praxis and socio-complex that is studio-based learning. Many educators quickly realised that the immediacy of constructivist, experiential and emergent learning in a co-located setting like studio cannot be replaced immediately or simply in an online setting. Attempts to make up for the loss of spatial proximity with temporal (online) proximity didn't seem to work as expected; orientation methods effective in studio, such as furniture layouts, activities and demonstrations, or informal breakout spaces etc., were unable to be replaced easily or failed completely.

The single overarching lesson from emergency remote teaching has been that moving studio-based curricula online is a non-trivial exercise.

Distance Design Education

Of course, there are a few institutions already teaching at a distance and using online and blended methods. The Open University in the UK (OU) is one of these and has taught design remotely since its inception in the early 1970s. During this time, the OU has developed many ways of approaching this mode of learning and teaching across a number of diverse subject domains, including design.

It might be assumed that it would be a relatively straightforward task to share this knowledge. But, the full richness of praxis that exists in studio and the myriad of tacit and implicit knowledge it requires (regardless of mode), makes this a very difficult task. What is particularly hard to do is to simply transfer aspects of complexity and richness from traditional to online settings: what works in one may only do so depending on particular conditions in another, and these are not always obvious.

The lesson for those of us already teaching at a distance was to realise just how much we, too, embody our own practice as tacit and implicit knowledge. Design is an inherently embodied practice where the unseen and hidden processes are just as important as the final proposal, and this is just as true in design education. The unseen and hidden, the tacit and implicit, the informal and unplanned, all turned out to matter far more than anyone thought.

Making Visible

Making the unseen and hidden properties of design education visible was a key motivation behind this Special Issue. The changes caused by emergency remote teaching meant that assumptions made in traditional studio settings had to be abandoned; invisible things had to be made real and tangible at a distance or left behind. This need to 'make visible' has arguably been the greatest challenge for educators.

Having said that, design educators had several advantages in this challenge, all of which are evidenced in this special issue. Firstly, designers are used to working with uncertainty, complexity and the vagaries of real-world settings where no perfect plan or design exists. Looking at the articles it is clear just how adaptive some of the teaching responses have been but also how aware of these complexities design educators were. There are probably greater connections between design and teaching practice than some realise.

Secondly, using creativity as a way of thinking and approaching challenges - not simply as a way of coming up with ideas. Inherent in designerly creativity is a *depth* of creative thinking that does not stop at one or two sketch notes but engages in thinking through design responses, often by iteratively implementing and testing the underlying value being created.

Finally, all design education is inherently and deeply emergent and constructivist: it is dependent on circumstances and contexts that change what we do as designers as well as *how* we do things. No design process or outcome is ever fixed beforehand and, as noted above, teachers are most aware of this contingency in studio:

> *"...something that works well one time may be ineffective another, and each new class is a very different experience." (Rowland, 2016, p. 229)*

It is these 'different experiences' we hope to capture in this Special Issue.

The experiences during the pandemic have forced us all to talk about our teaching and learning in ways that we would not normally do. The learning and experience that has emerged from this is critical to capture to inform current and future practice. As we transition from the pandemic setting there are a number of key lessons worth taking on board, some of which reflect deep problems in current studio praxis. As Colin Gray asks in this Special Issue, "*...what are we willing to replace, and with what justification?"*

To replace any encultured practice is difficult in any setting and, even though design is a creative practice, the habits and praxis we form around uncertainty can often be very rigid and fixed. Hence, being able to make informed and effective change is important, as well as being able to articulate and support such change in education settings that might not fully understand the modes of learning and teaching required for design education.

Lessons Learned

Here, then, are a few lessons drawn from the case studies and articles in this special issue. This is by no means a definitive list, but it certainly gives us, as a community, a few things to think about as we move forward.

You Can't Just Translate the 'Surfaces' of One Mode to Another

The first instinct of many educators was to replace spatial proximity (studio) with synchronous online proximity. This was only partially successful in that real proximities are the connections made between students, tutors, artefacts, and ideas. What must be transferred is the value of the experience underlying the surfaces of space and time. There are numerous examples of failed attempts to simply move a traditional curriculum online or to force a hybrid version and assume that these will work.

David O'Brien's case study, *On country – off country,* provides a good example of how an existing paradigm (on country discussion) is used to overcome technical challenges, where it is the underlying value (the act of specific and intentional forms of dialogue) that matters far more than simply the surface communication. In addition, it highlights the successful adaptation of emergent conversations in client-led projects *on country* to the more structured modes of online technologies by anticipating these conversations through simulations and allowing conversations to emerge in agile online presentations.

Similarly Miikka Lehtonnen, Noorin Khamisani, and Gionata Gatto argue in their article *Playful absence / absence of play* that studio can be created, regardless of mode, as an act of play. Specific actionable examples like this offer important lessons for anyone transitioning back to prior modes of teaching - it's the underlying value that has always mattered far more than surfaces in studio.

Who Gets to Speak - Who Takes Part

Different students (and even tutors) speak in different modes of interaction and many educators have reported being surprised by which students have been active in distance and online settings. As Colin Gray observes in the article *"Scaling Up" and Adapting to Crisis: Shifting a Residential UX Studio Program Online*:

> *"...more voices could be "heard" through Post-Its than would have been possible in the physical studio with verbal questions."*

This matches findings in general distance education research and raises the uncomfortable fact that some voices have not been prominent, or even present, in traditional studio settings in the past. Moving forward, it is not only important to make space for these 'hidden' voices once we return to 'normal', but to also ask what can we do to improve participation and representation for all voices in the studio? One example of a response to this is given in the case study *"Here's what we really want your class to be about!"* from Lesley-Ann Noel, who explores and builds on

the values that underpinned the work (relationality, community-centredness, and situatedness), to suggest transitions to alternative modes. Perhaps the continuing shift of attitudes toward blending modes of studio will allow further responses to this question, helping it become a focused area of study and research over the coming years.

Connections, Not Proximities, Matter Regardless of Mode of Teaching

This was one of the first lessons learned for many educators: without the orientation that studio and other norms afford, students had no immediate means of finding out where they were or where they needed to go. As Leigh-Anne Hepburn and Madeleine Borthwick observe in their case study, *Synchronicity in the Online Studio: A Study of Two Cases*, replicating even some of the synchronous and proximate signals and routines available in traditional studios, such as interactions and feedback between peers, can be a huge task in an online setting, and this is no less true in virtual studios designed to do this (Lotz et al., 2015, 2018). Similarly, the importance of interactions and praxis in a designer's education identified by Virginie Tessier and Marie-Pier Aubrey-Boyer, in their article *Turbulence in Crit Assessment: From the Design Workshop to Online Learning*, has to be understood and provided in any and all modes of learning and teaching. This also highlights just how much 'work' studio has been doing - when it is lost, we lose far more than realised simply because the proximities we have relied on in traditional studios are far more than only spatial or temporal. These can be replicated in other modes of studio if they are treated accordingly, such as visualising processes, establishing routines for communal working and fostering experimentation by giving learners ownership over shared online spaces, as outlined in the recommendations in the case study, *From Sharing Screens to Sharing Spaces* by Jon Spruce, Pete Thomas, and Sarah Moriarty.

Studio Depends on Habits of Practice - But Is Also Adaptable and Changeable

The results outlined in Katja Fleishmann's article, *Is the Design Studio Dead? - An International Perspective on the Changing Shape of the Physical Studio across Design Domains*, demonstrates just how important studio remains to design educators as a core part of practice and teaching. But this study also demonstrated the subject domain's ability to adapt and learn as shown in the significant shift in attitudes to blended modes of studio. This finding is extended in the case study, *The ones who have never been physically in a studio*, by Berrak Karaca-Salgamcioglu and İrem Genç, who demonstrate that the 'myth' of studio is also constituted (maintained and constructed) by students themselves, in this case hacking the studio to suit their needs. Both examples highlight the need to have better methods and approaches to research and scholarship across modes of studio learning, and, in particular, that moving beyond simplistic dualities of online vs offline, or face to face vs distance, can allow us to work with underlying patterns and values. In questioning the role of studio in *Making the Studio Smaller*, James Brown forces us to examine what it is that truly matters about studio and this is perhaps a more useful reflection point when considering adaption: not what we *think* matters, or what we'd *like* to matter, or even what we *have relied on* mattering historically.

New Words to Describe and Conceptualise In-between Experiences

We might need some new words (or better ones anyway) for concepts like hybrid; blended; synchronous; asynchronous; zoom fatigue; semi-synchronous learning and teaching. Even the phrase 'face-to-face' has been challenged - by students themselves - in terms of its underlying assumption. Being online does not mean a face is not present and this challenges what we assume 'being present' means in any setting. The value we give to different modes of learning

and therefore the value we place on certain activities and actions, has to be questioned as we transition away from emergency teaching. 'Being' in studio means far more than simply a body located in space and time, as is clearly demonstrated in the examples of studio being in the article *Everyday Routines and Material Practices in the Design Studio,* by James Corazzo and Layla Gharib. The sub-title to this article, *Why Informal Pedagogy Matters*, highlights a critical lesson for all educators to take from the last year.

New Opportunities Beyond 'Normal' Boundaries

Several of the case studies present creative and innovative responses to the crisis. As some boundaries closed, yet others were made possible, such as collaborations between colleagues around the world. When you read examples such as the case study, *Global Design Studio: Advancing Cross-Disciplinary Experiential Education During the COVID-19 Pandemic,* by Shital Desai, Ingrid Stahl, and Marianella Chamorro-Koc, what becomes clear is that we still have much to learn about international collaborations especially in terms of managing asynchronicity and local activity coordination. This is explored by Ibrahim Delen, Fatma Özüdoğru, and Burak Yavaş, in the article *Designing During the Pandemic: Understanding Teachers' Challenges in eTwinning Projects*, and how global working might be supported, sustained, and developed beyond individual projects by building interdisciplinary communities of practice. What we have as a community of design educators is a rare opportunity to reform the boundaries of participation, agency, emancipation and belonging to better respond to existing problems and challenges, such as representation and inclusion. Such opportunities not only explore who can design and where design might take place but, as with the examples in Noel and O'Brien, actively question the methods and structures of designing itself.

We All Need Support

It can be difficult to be a design educator in emergency educational settings, particularly if you are also a practitioner. The reflective study, *An Administrative and Faculty Autoethnographic Analysis of Shifting Modalities of Pre-service Technology Education Programming During the Onset of COVID-19*, by David Gill and Thomas Kennedy examines the challenges in maintaining hands-on and constructivist education in contemporary education. Importantly, it recognises the extent to which many educators went in supporting students during the emergency teaching response, observing there is a limit to what can be done without tailored institutional, technical and collegiate support. A positive example of such support is provided by James Thompson, Kate Tregloan, Phillipa Soccio, and Huiseung Song in their case study, *Dual Delivery Design Studios*, which outlines the strategic and operational approaches they took to ensure a blend of different modes of course delivery to suit individual needs. This also highlighted the personal, professional and pastoral support we all needed as design educators. Another exemplar of collegiate practice through team teaching is given in the case study *Teaching Design Thinking in a Research-Intensive University at a Time of Rapid Change*, by Robert O'Toole and Bo Kelestyn, who also allude to how they maintained connections to the wider community beyond their institution. As we look forward, this community will become critical as we all make decisions about future curricula and, perhaps, come under another wave of pressure to change modes of design education for reasons that are not necessarily pedagogically motivated, for example in response to the Climate Change Crisis.

Making Things Visible

Finally, and returning to one of the motivations for the special issue, it is clear that the transition has made a lot of things visible that previously have not been noticed (Jones, 2021). The issues faced by many of us may have felt like large problems: loss of studio, technology not working, lack of support, and so on. In online learning research the theory of learning hygiene argues that students rarely notice when things go well online but immediately notice when they go wrong. Each little 'wrong' thing contributes to an overall loss of confidence in material and an erosion in motivation and engagement. In distance design education this is a daily battle of hygiene as technology, demographics, and contexts shift.

But perhaps we also need to recognise the inverse of this - the 'little good things' that contribute to quality design education hygiene and experiences. Whether these little things are obvious little things, such as dialogic methods that help "focus the architecture student's attention towards the community's voices and aspirations" (O'Brien), or hidden little things that "reminds you that you're an art and design student" (Corazzo and Gahrib), they all matter; they all need to be recognised.

It may even be that the size of studio (Brown) is really a problem of scale, not volume - that the importance of studio lies, not the size of the space itself, but in the quality of all the little things in that space.

Acknowledgements

We thank all the reviewers who supported this Special Issue. We deliberately took a peer review approach to reflect the shared (and divergent) nature of the context design educators faced in 2020. In doing so, the nature of the peer review comments genuinely helped to further shape a real snapshot of practice, scholarship and thinking during this period.

Thank you, too, to the Design and Technology Education Editorial team, Kay Stables and Lyndon Buck, for their frequent and flexible support. The journal remains an Open Journal, accessible to anyone, anywhere, and this is 'paid for' by their personal time, effort and passion.

We would finally also acknowledge and thank the less visible contributors: the students, teachers, managers, publics, co-design partners, parents, wise people, communities, friends, family, that allow us, as researchers, to create our material. Without them we would have blank paper. Thank you.

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On Country – Off Country: Web Based Engagement with Indigenous Communities

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Abstract

Australia's first nation people have suffered deep loss stemming from the colonisation of their lands and restrictions on cultural practises. Despite endemic disadvantage, many people maintain profound connections to traditional lands, their *country*, and retain a desire to share their cultural knowledge. This presents opportunities for design academics and tertiary students to establish partnerships with indigenous communities. This paper casts a reflective lens over an architecturally focused case study with a remotely located indigenous Australian community to differentiate learning outcomes that are site based *on country* and those conducted in classrooms *off country*. In the pre-COVID era, the Bower Studio program within the Melbourne School of Design at the University of Melbourne was taught with both on and off country learning opportunities. Bower Studio coordinates small groups of students travelling on country to meet community members in remote Australian communities and facilitates indigenous elders travelling to attend classes in Melbourne. While this combination was accepted as best-practise, the suspension of in-person gatherings due to COVID threatened the integrity of this program and forced significant change. Reliant upon video conferencing it would be reasonable to expect that the loss of on country experiences would significantly hamper the student/community engagement whilst simultaneously diminishing academic outcomes. This research reflects upon the project to confirm that on country learning remains best practise, however there were unexpected benefits from off country engagements facilitated through video conferencing.

Keywords

indigenous design, on country learning, video conferencing, architecture pedagogy, bower Studio

Introduction

In response to the Covid 19 pandemic the Australian State and Territory Governments instigated a strict 'stay at home' edict beginning in late March 2020 restricting travel for all but essential needs. As the health threats increased the teaching program at the University of Melbourne was suspended from the third week of semester to reconvene one-week later with video conferencing technologies used as the primary tool for interaction. The university required all content to be delivered via Zoom with academics redesigning their delivery modes and course structure. In many subjects this redesign was straightforward as online lectures were commonplace. However, studio-based subjects, such as the architecture program analysed in this research, required a significant shift in the program structure as well as delivery methods.

Many teachers claim video conferencing is problematic with many students losing their 'voice' with this format. Research shows that educators find it hard to initiate, facilitate and maintain group discussions, particularly when students can 'opt out' and minimise participation by turning off their sound and camera (Cox, 2011; Lederman, 2020; Ludwig-Hardman & Dunlap, 2003). Reading students' body language becomes more difficult and the informal sketches, drawings and models that form an integral product of small group face-to-face engagements are inhibited when undertaken via Zoom screen sharing. It was anticipated that these difficulties might become especially apparent when video conferencing was undertaken across cultures.

Complicating matters further, the introduction of travel restrictions compounded the program's redesign by eliminating possibilities to take students to visit the partner community in remote Northern Territory. Visits to tribal lands provide opportunities for 'on-country' learning as differentiated from the learning in the classroom and 'off country'. In the case study discussed here, travel restrictions removed the chance for indigenous community members to visit Melbourne as well as students spending two weeks embedded within the remote community.

As the program's designer and coordinator, the author was acutely aware that the integrity of the program was at risk. Students expected face-to-face teaching and the opportunity to visit and learn with indigenous leaders. More than thirteen-years' experience teaching this type of program has shown that the time embedded within the community would have profoundly shaped the student experience and their subsequent design outputs. During 2020, in week three of a twelve-week semester, these expectations were shattered by the inability to travel on country. In addition to the loss of face-to-face learning, the loss of direct contact to country and people posed significant pedagogical concerns and carried significant implications for the studio's academic outputs.

The importance of on country learning for indigenous leaders in Australia cannot be underestimated. When on country students absorb a range of narratives and landscapes that are impossible to recreate in a classroom setting. The profound connections significant numbers of indigenous Australians have to their land are difficult to comprehend – without on country experience this link becomes manifestly difficult to understand and impossible to bridge. This paper discusses an architecturally focused case study to identify how this move to off country learning was managed and identifies ways that the student experience was diminished. It goes on to ask if there were any 'silver linings' to the program design that might enhance the design of future projects. After detailing the systems used to address this loss, the paper asks if video conferencing technologies can play a useful role during consultation processes involving indigenous and non-indigenous people and demonstrate the value of engagements undertaken off country.

What is 'On Country' Learning All About?

Indigenous Australians have sustained contact with their land for over 65,000 years with their connection to *country* defining their very being (Langton, 2018). Within the Australian context the colonial disregard of indigenous knowledge systems was widespread and governed attempts to erase indigenous culture (Perkins et al., 2008). Indigenous people were forced from their traditional lands and family structures dismantled during this brutal act of colonization.

Over successive generations much of the intimate knowledge about the seasonal changes in the land, including rainfall, flood and fire risks, soil type, food production, bush medicine, flora and fauna, has been lost. Without adequate knowledge of these interlinked factors the sustainability of the Australian landscape has subsequently been degraded. More recently, the importance of this deep understanding and connection to country has been recognized with university programs funded specially to link indigenous knowledge with cutting edge research. As one example among many, the expertise within the indigenous community has caused a significant shift in contemporary land management systems in Australia. This now encompasses indigenous knowledge systems to mitigate environmental risks such as wildfire, the effects of drought and land degradation.

Collaborative research involving both indigenous and non-indigenous people has almost exclusively been undertaken on country – the lands that are the subject of the particular research/learning projects. Indigenous Australian researchers speak of the importance of on country learning: “our consciousness originated on country so learning on country is a consciousness enhancing program that we teach all peoples” (Moran et al., 2018). While many indigenous elders want to share knowledge more widely and embrace opportunities to work with tertiary students, both domestically and internationally, there are significant challenges that must be overcome for this learning to take place. Within this Australian context, the sharing of indigenous knowledge is an acutely challenging activity underscored by complex cultural protocols. The structures that govern indigenous knowledge, its ownership, ways it can be told and places it can be told are exceptionally intricate with both formal and informal rules that non-indigenous people find difficult to comprehend. Specific stories and places can be shared with non-indigenous people, while others remain exclusively linked to specific tribal groupings and can only be told in specific physical settings. Adding to these challenges, the coordinators of teaching programs in Australia must address the difficulty in physically and conceptually linking students to these, often remote, locations whilst also addressing logistical concerns such as the complex travel required, lack of appropriate accommodation in remote locations and climate concerns associated with the extended wet season and extreme heat.

Despite the potential for video technologies to aid connections between on country indigenous teachers and off country learners based at universities, research examining this type of relationship is uncommon. One of the rare case studies to emerge was the Teaching from Country program initiated in 2009 at Charles Darwin University linking indigenous elders from the Yolngu people of north-eastern Arnhem Land in the Northern Territory of Australia with university students located on campus at universities in Australia and California. Reflecting on these discussions and experiences, facilitated through video screens and transmitted via satellite, the researchers described the ensuing confusions and collective frustrations that accompanied the unstable connections and technological complexities noting that the successes of the program was to be measured more by the shared experiences and nurturing relationships rather than the detailed planning and subject management (Christie et al., 2010).

On Country at Kalkaringi

The Bower Studio is a university-based design/build program with an extensive history working with indigenous communities in Australia and Papua New Guinea. In 2020 the program was to be managed in conjunction with the Gurindji Aboriginal Corporation responsible for indigenous

welfare at the Kalkaringi community in remote Northern Australia. The collective team was preparing an intensive program in April/May 2020 to refurbish an old clinic building and reconfigure it to become the new community centre.

This community's involvement in this program must be understood in the context of their own story and their own country. The Kalkaringi settlement is in a remote region of Australia's Northern Territory 800km from the capital city Darwin. It houses people from key tribal groups, Gurindji, Warlpiri and Mudburra, famous for playing a leading role in the fight for indigenous equality and land rights over country stolen by white colonists at the end of the 19th century. In 1966 the indigenous workers at the Wave Hill Cattle Station rebelled against the white station owners during the 'Wave Hill Walk-off', a strike lasting eight years that precipitated the indigenous land rights movement in Australia. The striking workers and families won the support of trade unions, university students, the Communist Party of Australia and later, the general public (Ward, 2016). In 1975 Gough Whitlam, as Australian Prime Minister, returned a portion of the land to the Gurindji in a landmark case of the repatriation of stolen country to indigenous control. This event, the first such 'land handback' is celebrated at the Kalkaringi and Daguragu communities in August every year during the 'Freedom Day' festival.

The University of Melbourne has a long partnership with the Kalkaringi settlement beginning in May 1970 when architecture lecturer Stan Barker arrived with a small team of supporters that included political agitator Frank Hardy, two tradesmen and architecture students. After hearing community elders voice their needs and aspirations the team began discussing housing made from local earth and thatch with work beginning almost immediately on housing prototypes (Ward, 2016). The relationship was rekindled in 2014 when architecture lecturers David O'Brien and James Neil were invited to meet Gurindji, Warlpiri and Mudburra elders at the site of the 1966 Walk-off. Whilst out on country, the elders asked for help creating a place to honour the leaders of the Walk-off and assistance providing opportunities to share this history with the broader public.[1] Fully aware of the tumultuous history of non-indigenous architects working in indigenous communities the pair decided to use the University of Melbourne's Bower Studio program to embark on a longer-term journey assisting the community meet their broader goals. There are valid reasons for this incremental approach as there are many examples throughout Australia where the outcomes of indigenous and non-indigenous partnerships have not been well conceived following valid criticisms that the indigenous 'voice' was not well heard or valued.

Bower Philosophy

The University of Melbourne's Bower Studio addresses the importance of projects being indigenous led by working modestly, under-promising and over-delivering and taking the time to listen and process the indigenous voice. Consultations are seen as a two-way engagement with cultural learnings and engagements from all participants. Evidence shows that it is important that this activity happens on country on the lands inhabited by indigenous people. Similarly, it is important where possible, for this engagement to work both ways with indigenous members also learning on the country inhabited by the student team. In this case it

[1] You can find out more here: https://www.youtube.com/watch?v=eQdfXlWdrFQ

was proposed that a delegation of Kalkaringi community members would also visit Melbourne to lay the groundwork for later conversations on country.

It is important to note that the Bower Studio program is based on a different premise to the typical 'design/build' model used by universities worldwide. Instead, a more complex dynamic has been introduced where, from the students' own perspective, the building and consulting phases of a program are undertaken simultaneously before the students go on and prepare their own design ideas (O'Brien et al., 2016; O'Brien, 2018). By disrupting the traditional design/build model the sequence ensures a better outcome where the students' designs are informed by a deeper understanding over the complex web of aspirations, capabilities, cultures, programs and budgets that define community development projects.

While keeping the community's key aspirations in mind, particularly the design and construction of the proposed multi-million-dollar Gurindji Heritage Centre, it was agreed to take a step by step approach to build deeper relationships within a flexible program, time frame and budget. Without a secured source of dedicated funding, the expectations that the facility would be operational in a short time frame were realistically low. Stemming from the 2014 discussions, Bower Studio has recognised this and helped develop a series of 'entrée' projects in conjunction with local community groups and work teams. These projects have included the three pavilions that mark the 'Wave Hill Walk-off Trail' (2016), extensions to the Karungkarni Arts Centre (2018), three bough sheds (2018/19) and designs for the sports facilities in Libanangu Park. The pre-Covid19 schedule had also planned that the 2020 Bower Studio team would assist the Gurindji Aboriginal Corporation design and build shade structures and landscaping to the Kalkaringi Community Centre during its refurbishment phase. This plan was to include a Bower Studio team of three staff and twelve students working alongside a local work team on country for twelve days in April/May 2020.

Working on country is arguably the key learning experience for the architecture school's team. Embedded with the community at Kalkaringi, students would have a chance to engage with the elders, hear their stories and aspirations, and engage with the ways people use and appreciate space on country. For this to work equitably, it is important to reciprocate on country learning experiences to include visiting delegations of indigenous community leaders coming to Melbourne. Prior to the program at Kalkaringi a delegation of three Karungkarni Arts representatives was scheduled to come to the university to meet the Bower Studio team and visit cultural sites in Melbourne. An ambition for this component was to provide a basis on which the indigenous representatives could visit, see and feel their way through key cultural sites in Melbourne, effectively being on country in unfamiliar urban places. It was anticipated that this would help foster a shared language and connection between the indigenous and non-indigenous partners to facilitate deeper conversations around precedent, the occupation of space and imagery, and their connectivity with future design outcomes.

Program Restructure

The schedule to include components of on country learning was abandoned in April 2020 as the Covid19 pandemic closed state borders and stay at home orders were issued. The timing was unfortunate – just two weeks before the Kalkaringi teams' arrival in Melbourne and three

weeks before the university team's arrival in Kalkaringi.[2] Despite our requirement to cancel the program's on country phase the three main consultation groups in Kalkaringi; the Gurindji Aboriginal Corporation, Karungkarni Arts and the Warnkurr Social Club, were each well invested in the outputs of the program and were keen to proceed with video conferencing. The students were grouped into four and partnered with one of the three groups. The Gurindji Aboriginal Corporation led discussions on the proposed new community family centre, Karungkarni Arts focused on the culture/heritage centre program and the Warnkurr Social Club drove discussions on renovations to the club. While two of these projects (club and family centre) have pre-existing funding commitments, the culture/heritage project is significantly more costly and remains unfunded. Students traditionally have a choice of which project to pursue, however in this restructure the academics allocated students to groups to maintain momentum and build a degree of certainty in difficult times.

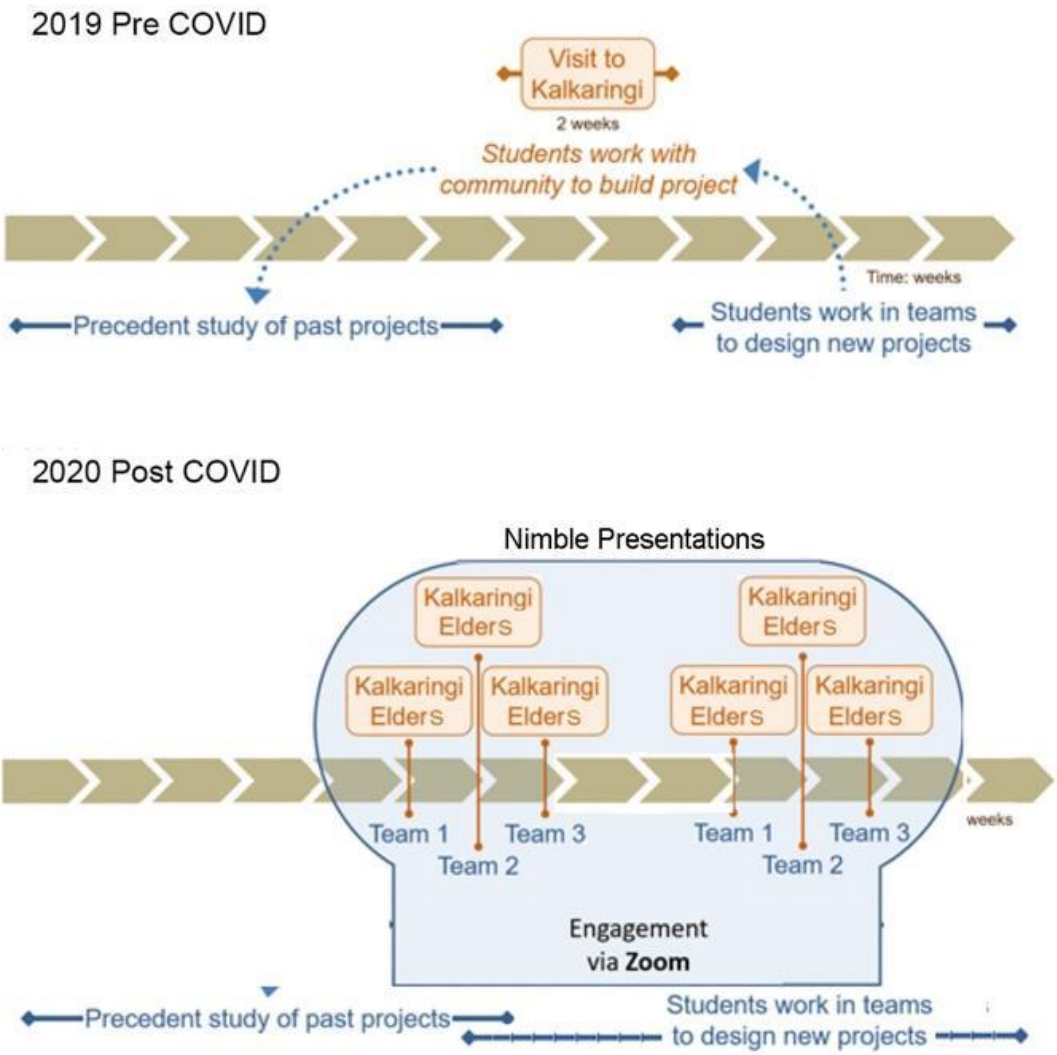

Figure 1. Diagram of program structures pre and post COVID

[2] This component of the program was postponed to July 2021.

The Bower Studio leaders were anxious that the lack of on country learning experiences, impacting both the Kalkaringi and Melbourne delegations, would be a significant loss to the program's integrity. While this was indeed problematic, each of the three consultation groups made a particular effort to use the video conferencing technologies to connect and work to create design outcomes.[3] Video conferencing sessions were held weekly with each community group. Each student, working in groups of four, was assigned to a specific project (family centre, culture/heritage centre or social club) to produce sketch designs.[4] Each group was supported by community mentors with specific interest in that project. Bower Studio academics acted as facilitators in these conversations with the structure of each session modified to suit the overarching program. Initial conversations were focused around broader community needs and the selected site, followed by sessions developing specific client briefs and discussions around the student's research on the precedents for each project. This led to weekly sessions where each group of students presented their own design ideas so they could then be refined in consultation with the indigenous clients and academics. In conjunction with these weekly sessions, academics provided additional three-hour sessions with students to reflect upon the virtual on country sessions.

The screen sharing options offered in Zoom video conferencing encourage a specific type of narrative that folds around sequential images delivered in a tightly controlled manner. This is a useful process when students present final designs for critique. However, as the following sections outline, this step by step process posed a challenge for the fluid and dynamic discussions that have traditionally facilitated the most useful design and consultation sessions.

Misalignments and Losses

It would be possible, at great length, to detail the combined losses to the program associated with the inability for Kalkaringi representatives to visit Melbourne as well as the architecture students travelling on country. At the most basic level, addressing the associated technical complexities to engage via video conferencing provided many challenges including the (un)reliability of the technologies and difficulties aligning meeting schedules. This required a level of organisation and technical proficiency that was not typically negotiated in the relationship between the university and community.

Perhaps most importantly, the inability of the 2020 cohort of architecture students to personally visit the Kalkaringi community left them with a vastly diminished understanding of the links indigenous people have with their lands. Previous staff and student cohorts have developed an appreciation of the ways on country experience adds to their education. Knowledge emerges in many forms and is, for example, supplemented by personal experiences such as camping in tents and cooking meals together on open fires. Campsites change location after two or three nights as the group explore the countryside and follow narratives that encompass concepts of time and place. Enveloping this tactile learning environment is the

[3] Special thanks to Rob Roy, Quitaysha Thompson, Leah Leaman, Lisa Smiler, Michael Fairweather, Penny Smith and Phil Smith.

[4] These can be seen at https://bowerstudio.msd.unimelb.edu.au/projects/2020-kalkaringi-nt

metaphysical presence and storytelling by indigenous elders that creates a profound impact on the team. Less formal opportunities include time at the social club, sharing a beer and a yarn after a day's labour. Working alongside the community has traditionally provided further opportunities for students to engage in conversations in a dynamic and informal setting. The loss of this type of activity in 2020 was keenly noticed by the indigenous leaders as well as the academics. Students had heard of the importance of this from peers and were aware that their experience was not as rich as it might have been.

Attempts to ameliorate this loss for the 2020 student cohort was never an easy task for the community and academics. The most noticeable challenge was to negotiate the subtle misalignments between expectations – indigenous/non-indigenous, client/designer, digital native/digital newcomer. The community members were keen to have a voice in the design of the three programs (family centre, culture/heritage centre and social club) and were highly invested in the design outcomes. The students wished to have their design ideas shaped by community representatives in conferencing sessions. During 2020, the single largest challenge for the Bower Studio academics was identifying how this video conferencing tool might be manipulated to address some of these identified losses, while also ensuring a rigorous and enjoyable consultative process for all participants.

Unexpected Benefits with Video Conferencing

Creating a culturally safe space for video conferencing was crucially important if the 2020 Bower Studio program was to succeed over the remaining nine weeks of semester. Having established relationships with community members stretching back seven years and more than a dozen visits to Kalkaringi, the academics had a solid basis on which to work. The staff had begun a professional relationship with the students and were dedicated to providing the best learning experience possible. Facilitating a robust and respectful dialogue with both cohorts required academics to rethink their use of the video conferencing technology – particularly in the delivery of the narratives that accompany aspects of design analysis and critique. Weeks 4 to 12 of semester have traditionally been allocated for students to introduce and critique design projects, firstly by other architects before moving on to sharing their own narratives that conceptually underpin their design. This process has traditionally been highly curated and sequential with the audience, for the most part, taking a relatively passive role.

This technique lends itself to a linear process that diminishes the capacity for fluid and dynamic conversations and decision making. To counter the risks to this project associated with linear thinking and discussions, the academic staff placed an emphasis on what we now term 'nimble' presentations. The use of the word nimble is to highlight the need for the expanded types of flexibility required during consultations. In contrast to a 'static' model, the nimble must be choreographed in such a way as to ensure the voice of the client is celebrated rather than compromised. In its most simplified form, a nimble presentation can be responsive to the immediate conversations. This requires each student team to accept and pre-plan for a series of alternative narrative pathways. With sufficient preparation it is possible for students to pre-choreograph a range of alternate scenarios and have these on hand to play as required. Using the game of tennis as an analogy, the server is not always sure what their next shot will be before the ball is returned. It might be a forehand, backhand, lob or topspin. However, the possibilities for all of these shots have been anticipated, practiced and can be used, or not, as

required. Similarly, a card player may have several cards in their hand but selects the most strategic card to play depending on the circumstances. In a similar vein, the architecture students were asked to anticipate how the conversation with the client might unfold and how each question and response opens new doors (which in turn opens others). With limited time for client meetings the larger the catalogue of ideas the students have prepared for and are at hand, the more purposeful and satisfying the conversation. To help manage this process the academics had met with each student group prior to the community meeting to clarify opportunities to help facilitate discussions. In effect, each student group had prepared multiple narratives that could then be focused on the most relevant issues emerging during the community meetings. In many cases the ideas could be quickly abandoned leading to quite focused discussions around opportunities with greater potential. It was noticeable that the video conferencing meetings could, at specific times and purposes, work to add more significant focus to interactions that would be almost impossible to facilitate during on country sessions.

Conclusion

Despite the profound loss of on country learning opportunities in 2020, it is valuable to take a reflective lens to this particular modified architectural program in the wake of the reconfigurations required by COVID restrictions. While the required video conferencing formats diminished opportunities for a broader community input at Kalkaringi, key community representatives were able to focus the architecture student's attention towards the community's voices and aspirations. This focus did benefit the program as the video conferencing provided a timely platform for indigenous community representatives to develop a positive and useful rapport with the students. Risks that the community's voice would be diminished by this video conferencing process were real. However, they could be ameliorated by each of the small groups discussing and critiquing designs with a dedicated portion of the teaching program encouraging discussions where 'nimble' thinking and innovative presentation techniques facilitated open-ended discussions in ways that were, perhaps, more effective than the traditional linear narratives associated with video conferencing.

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Playful Absence / Absence of Play: Rethinking the Design Studio in Online Environments

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Abstract
While the pandemic has had a tremendous negative impact on societies, it has nonetheless provided us with a sort of living lab for investigating and exposing consolidated models of design education. The design studio, often conceptualized as a spatio-temporally inhabited milieu with translocal norms and conventions, became a blended environment where students and instructors alike had to establish new conventions and ways of knowing and inquiring. Employing Sicart's notions of play and playfulness as our theoretical lens, this paper argues how online learning has opened up a space for students and instructors to blur the boundaries of the design studio through the intersection of play and absence. Absence of things gives rise to being playful, and absence of play is required to sustain collaborative play. Through student interviews and our personal reflections, our findings reveal how play spatio-temporally fragments the design studio. In the absence of pre-existing conventions, play negotiates the boundaries of the design studio. Moreover, creating the virtual design studio can be understood as an emergent act of play; by being playful, we partly leave behind the norms and assumptions of the physical design studio to create something new. In addition, and paradoxically, creating a personalized and community-based way of being helped in seeing the immediate surroundings as the studio. Here, creating new methods for working in the studio playfully created boundaries for play. Theoretical and pedagogical implications shed light on the future of design studio and education as spaces that can be collaboratively enacted.

Keywords
Design education, Design studio, Virtual design studio, Play, Playfulness, Online learning

Introduction
The Covid-19 pandemic forced many higher education institutions (HEIs) to switch to online learning to prevent the virus from spreading. While the pandemic had a tremendous negative impact on societies and students' well-being (e.g. myOCADU, 2021), it has nonetheless provided us with a sort of living lab for investigating and exposing consolidated models of design education. The design studio, often conceptualized as a spatio-temporally inhabited milieu (Corazzoa, 2019; Schön, 1987), with translocal norms and conventions, became a blended environment where students and instructors alike had to establish new conventions and ways of knowing and inquiring.

While previously the design studio was conceptualised as a dedicated physical space, the pandemic further challenged this notion by fragmenting the design studio into multiple spaces (e.g. Green et al., 2020; Jandrić, 2017). While prior studies have expanded our understanding of

the studio as a manifestation of design's signature pedagogy (Shulman, 2005), the pandemic forced many design educators into a situation where such signature pedagogies were no longer at their disposal. However, the design discipline does have a relatively long-standing track record of virtual design studios (VDS) (e.g. Iranmanesh & Onur, 2021; Jones, 2013; Kvan, 2001), yet what makes the current situation different is the speed with which online learning was expected to be implemented. In the absence of extensive planning and preparation (Marshalsey & Sclater, 2020), how has the VDS experience been created? To this end, we ask the following research question:

> *How do students and educators co-create the virtual design studio and how can this act of creation be theorised through the lens of play?*

In this paper we employ Sicart's (2014) notions of play and playfulness as our theoretical lens to argue how online learning has enabled a space for students and instructors to collaboratively reconceptualise the design studio through alternative modes of embodied learning and engaging with their surroundings and each other (Marshalsey & Sclater, 2020). Here, mobilizing Sicart's (2014) work is useful as it builds on Huizinga's (1992) by going beyond seeing play as an encapsulated activity (see also Consalvo, 2009; Malaby, 2007): to play is a "an appropriation process by which human agents engage in an autotelic activity in a world mediated by…technology" (Sicart, 2019, p. 523). With this, we contribute to extant discussions on the creation and nurturing of VDS.

The manuscript is structured as follows. We cover relevant literature on design studios, after which the theoretical framework is presented. The following section describes our research context and methodology. Then, findings will be presented, and in the discussion section we connect our findings to the current body of knowledge by offering both theoretical and pedagogical contributions. Finally, the conclusion marks the end of this paper.

Literature Review: Design Studio and Teaching Design Online

Although the design studio has predominantly been understood as a physical space (e.g. Boling et al., 2016; Kuhn, 2001; Schön, 1984, 1985), during the last two decades or so we have seen promising conversations seeking to argue that the design studio can also be virtual (e.g. Maher et al., 2000). While the design studio as a physical space is conducive to the emergence of tacit knowing, Dutton and Willenbrock's (1989) review of Schön's (1985) book reminds us that the physical space does not reign supreme: instead, emphasis should be on how and why students and instructors interact with each other within the space. Having said that, prior research has found positive evidence regarding learning efficiency in the design studio (e.g. Demirbas & Demirkan, 2003; Kvan & Jia, 2005), thus highlighting the central position it holds in design education. Nonetheless, there are two main streams of research pushing the envelope on the design studio: the first one aims at legitimising studio-based pedagogies in the higher education context (e.g. Wang, 2010), while the other stream looks at the conditions under which design education could be delivered online (Fleischmann, 2020; Kvan, 2001).

Perhaps an outcome of the emergence of collaborative digital platforms around the turn of the 21st century, Maher et al. (2000, p. 3) conceptualise the virtual design studio as "an environment for collaboration that has no walls, an environment that facilitates sharing design

information and supporting interaction regardless of place and time". In addition, bringing attention to technical and social issues, they (ibid.) emphasise technological integration (i.e. collaboration not hindered by people using different hardware) and, perhaps more importantly, the need to create social practices for collaborating online. In other words, if technical problems seem solvable (e.g. software compatibility and internet access), the actual challenge might be about how to create practices that move beyond the physical – virtual dichotomy.

Providing a promising argument for going beyond virtual – physical dichotomies, Jones (2013) calls for more focus on conceptual and collaborative aspects that do not aim at creating a simulacrum, but instead enable multidirectional contributions. Approaching the dichotomy from a different perspective, Kvan (2001) argues that VDS allows low-income students to participate in design education, thus highlighting the political agenda of VDS: by approaching the design studio from inclusivity's point of view, Kvan (2001) sheds light on how and why we ought to reimagine the design studio as a virtual space. While approaching the VDS from different viewpoints, both Jones (2013) and Kvan (2001) highlight two issues: first, technology and its limitations, and second, sociocultural norms and assumptions. Whereas the former is an infrastructural issue, albeit with consequences for the teacher (e.g. how to ensure the flow of the session if the connection breaks down), the latter seems to be something we can influence.

While technological limitations do present design educators and students with potential challenges (e.g. Cervini, 2016), how we go about creating studio-based learning experiences online predominantly seems to be an issue concerning individual creativity and the ability to go beyond replicating face-to-face instruction (Fleischmann, 2020; McGee & Reiss, 2012). For instance, in their study on design students' perceptions about blended learning, Fleischmann (2020) found that students are keen to opt for blended learning due to its flexibility as long as there is immediate feedback, interaction and collaboration. Similar findings were reported by Iranmanesh and Onur (2021) who studied VDS during the Covid-19 pandemic. According to their findings, students preferred a blending of the physical and the virtual and achieving this seemed to require both students and teachers to adopt new roles (i.e. students becoming more active and teachers letting go of control) (see also Stuart-Murray, 2010).

Technological issues aside, an undertone going across most studies on VDS seem to highlight two aspects: rethinking roles and interaction. Prior research has yielded positive results on VDS (Fleischmann, 2020; Iranmanesh & Onur, 2021; Pektaş, 2015) in terms of student satisfaction and meeting learning outcomes. However, despite a growing body of encouraging results regarding VDS, we still know little about the transition from face-to-face to online learning in the context of design education. We now know that design education can be delivered online, but how do students and educators alike embark on the transitionary process to create the design studio online? More attention ought to be given to the interaction dynamics between individuals, materials, and technologies as constituting the design studio, which is why in this paper we utilise Sicart's (2014) theory of play as an empirical way of discussing who participates in creating the VDS, by what means, and why.

Theoretical Framework: Sicart's Theory of Play

Whilst not an exhaustive definition of play, Sicart provides us with an enticing starting point for conceptually understanding it:

> *"To play is to be in the world. Playing is a form of understanding what surrounds us and who we are, and a way of engaging with others. Play is a mode of being human." (Sicart, 2014, p. 1)*

Perhaps most importantly, these words seem to make a distinction between play and games (Malaby, 2007), thus departing from Huizinga's (1992) encapsulating take on play because technologies have blurred the boundary (e.g. Consalvo, 2009): as Sicart (2014, p. 4-5) continues, games are a manifestation of play – to play is a way to engage and express our being in the world (ibid., p. 5).

More specifically, Sicart (2014) theorizes play as consisting of seven aspects. In essence, play is contextual, carnivalesque, appropriative, disruptive, autotelic, personal, and creative. Here, play often emerges through "artificially created objects or situations" that are "designed as mediated by things created to facilitate the emergence of play" (Sicart, 2014, p. 7). For instance, Sicart (2014) often refers to Lego blocks as inviting play, while Bateson and Martin (2013) describe how Wolfgang Amadeus Mozart was playful in his music. Both of these examples speak for the ubiquitous nature of play that is not confined only to the realm of games (Consalvo, 2009; Sicart, 2019). What is of essence here is that play is a creative act involving breaking the rules, and playful play indicates having fun while doing so (Bateson and Martin, 2013).

While context loosely defines the boundaries of play, the very nature of play can be carnivalesque (a fine balance between creation and destruction), appropriative (hijacking a context that was not intended for play – here, Sicart (2014, p. 26-27) notes that being playful is an attitude that allows the appropriation of contexts not intended for play), and disruptive (through appropriating a context, play disrupts the status quo). Consequently, play is also autotelic (loosely demarcated activity with its own purposes), creative (play affords a certain level of self-expression), and personal (implicitly understood as a phenomenological experience) (Sicart, 2014).

In terms of how Sicart's (2014, 2019) theorisation on play has been applied in various contexts, París and Hay (2020) illustrate how learning through the arts can be playful in that it relies on exploration, failures, and collaboration. Similarly, Kinder et al. (2019) discuss public service innovations from the perspective of play: they argue play to give rise to learning and innovation since to be playful is to imagine the status quo from a novel perspective or to make fun of each other to reveal everyone's blind spots. Thus, play is not an activity reserved only for games (Malaby, 2007; Sicart, 2014), but something that permeates the social fabric from learning and working to sexuality and politics (Alexandersson & Kalonaityte, 2018; Tiidenberg & Paasonen, 2019). In Sicart's (2014, p. 27) own words:

> *"…playfulness reambiguates the world. Through the characteristics of play, it makes it less formalized, less explained, open to interpretation and wonder and manipulation. To be playful is to add ambiguity to the world and play with that ambiguity". (Sicart, 2014, p. 27)*

Methodology: Student Interviews and Personal Observations During the Pandemic

Data for this study was collected from two sources: interviews with students right after the autumn 2020 semester and our personal reflections on teaching design online during 2020. By also interrogating our own experiences we bring together students and instructors as collaboratively constituting notions of play when trying to take the design studio online (as per Adams et al., 2015; Lehtonen & Gatto, 2020).

Research Context

Dubai Institute of Design and Innovation (DIDI) is a relatively new design school (first cohort started in 2018) in the Middle East region offering a 4-year undergraduate program (BDes.) during which the students get to choose two concentrations out of four (fashion design, multimedia design, product design, and strategic design management). As of writing this paper, the first cohort of students at DIDI is finalising their third year and there are a little over one hundred students and fifteen teachers in the faculty.

During 2020, we taught both second- and third-year students in fashion design, product design, and strategic design management. Apart from a few face-to-face sessions during the autumn term, all of our courses were delivered online as per the Ministry of Education's requirements. In our university, we mostly utilised Microsoft Teams to deliver our courses, and in addition we also used Instagram and YouTube to share videos with our students (e.g. tutorials, abstracts of readings) and each concentration emphasised various software to help the students visualise their design projects. In strategic design management, courses focussed on reinterpreting the case organization's ethos through a design project, transforming design thinking methods into games (either digital or analogue), and covering theoretical aspects of the concentration. Fashion design courses focussed on developing a conceptual design process through to digital and physical outcomes underpinned by design for sustainability principals. Product design courses explored how objects can be designed and programmed to behave as social agents, through a critical analysis of their socio-technical applications and implications. Thus, despite learning happening online, learning through hands-on making was still an integral part of the courses we delivered.

Data Collection

For the purposes of this study, we employed semi-structured interviews with the students as our main source of data to explore themes and topics related to learning about design in online environments. We interviewed nine students out of seventy-two from all four concentrations who were in their second or third year since we had been teaching both cohorts. Table 1 sheds further light on the participants.

Interviews lasted between 45 and 60 minutes and they were conducted in English via Zoom by the first author. The interviews were recorded with the participants' permission and transcribed verbatim immediately afterwards. During the interviews, we focused on the following themes: learning before and during online learning, four dimensions of the design studio (as per Schön, 1987), body in the design process, and professional and academic future.

Prior to starting the data collection phase with the students, the first author had separate conversations with the second and third author, during these conversations we reflected on our private and shared experiences teaching online during 2020. At this point we did not impose play as a theoretical lens to our experiences, instead the focus was on making sense of how and why we designed our courses during spring and autumn terms, as well as thinking reflexively about our role as educators in creating a shared space with the students within predetermined and institutionalised frameworks of power and control (as per Calafell, 2013).

Table 1. List of participants with relevant background information.

Participant	Concentrations	Gender	Year of studies
Participant A	Product and multimedia design	Male	2nd year
Participant B	Strategic design management and multimedia design	Female	3rd year
Participant C	Fashion and product design	Male	2nd year
Participant D	Product design and strategic design management	Female	2nd year
Participant E	Fashion design and strategic design management	Female	2nd year
Participant F	Multimedia design and strategic design management	Male	3rd year
Participant G	Product and multimedia design	Female	3rd year
Participant H	Product design and strategic design management	Female	2nd year
Participant I	Fashion and multimedia design	Female	3rd year

Data Analysis

The interviews were analysed following the Gioia methodology (Gioia & Chittipeddi, 1991; Gioia et al. 2012; Gioia & Pitre, 1990) that is well suited for exploring emergent phenomena through interviews. In essence, Gioia methodology organises the data into three categories: first order concepts, second order themes, and aggregate dimensions (e.g. Gioia et al., 2012). While not linear or rigidly sequential a process, the aim here is to move from participants' own words towards more theoretical explanations. Thus, the first author went through the interview transcripts searching for relevant codes, and this resulted in 184 1st order concepts. Somewhat alongside this stage, we collectively discussed the data and went through the 1st order concepts to consolidate them so they could be more manageable to analyse. At this point, and in line with the Gioia methodology, we engaged with literature to move towards second order

themes. Here, we utilised Sicart's (2014) seven aspects of play as a theoretical referent because the themes seemed to suggest play as helping us "describe and explain the phenomena we are observing" (Gioia et al., 2012, p. 20). In addition, two additional themes were included – spring term and summer break – to theorise on the emergence of play. Finally, the second order themes were utilised to arrive at aggregate dimensions; taken together, they form a network of theoretical insights shedding light on the topic we initially started researching (Table 2).

Table 2. Data structure for this study.

1st order concepts	2nd order themes	Aggregate dimensions
Lack of structure	Spring semester – absence of play	Preconditions for play
Lack of boundaries		
Lack of materiality		
Preparing	Summer semester – routinize	
Distancing		
Dealing with ambiguity		
Absence of body language	Contextual	Intentionality
Blending spaces		
Being in control		
Sense of achievement	Autotelic	
Sense of discipline		
Presence of others		
Redesigning surroundings	Appropriative	Transmute
Rethinking materials and body		
Boundaryless studio		
Exploring materials	Carnivalesque	
Peephole		
Absence of slack		
Hijacking flow	Disruptive	
Distracting self		
Revealing self		
Humanizing others	Personal	Eroticise
Pacing		
Sense of growth		
Challenging assumptions	Creative	
Crafting positivity		
Self-work		

Above, the findings are presented sequentially only for the sake of clarity. In the next section, we elaborate on the findings by shedding light on how transitioning to a VDS can be understood as a form of play by both students and educators.

Findings

By exploring the emergence of the VDS, our findings indicate the importance of play and being playful when it comes to going beyond replicating the physical design studio. The theoretical framework we crafted based on the findings provides us with insights on what gives rise to the VDS as well as how it is sustained over time. At the same time, intersections between absence and play point towards the bricolage of play, indicating that play is not necessarily an activity in which everyone always simultaneously participates, but instead the VDS's affordances point towards play being dynamic. Below, we will separately go through the 2nd order themes according to the aggregate dimensions, to illustrate the dynamics between the dimensions.

Preconditions for Play

The difference between spring and autumn semesters was rather tremendous, mostly because we only had two weeks during the spring semester to prepare for online learning whereas for the autumn semester, we had the whole summer to prepare (although the decision to go fully online was announced a couple of weeks prior to the beginning of the autumn semester). While in the beginning we felt the immediacy of the switch to be quite stressful with the pandemic causing additional anxiety, by the same token we also decided to try to continue teaching like we did prior to the pandemic, albeit in online format. Reflecting on this decision, we now realize the immediacy and the ambiguity of the situation enabled new ideas and, eventually, play to emerge. For example, and as the students, on the other hand, described the spring semester as 'a struggle' (Participant B), 'anxiety-provoking' (Participant C), 'being everywhere' (Participant D), and 'a mess' (Participant G), thus revealing an absence of play due to the aforementioned immediacy and ambiguity in the situation. During the summer, however, both students and educators had time to reflect on the spring semester as well as prepare for a semester that might or might not have been online again. In many ways, we all spent the summer break preparing for the 'worst':

> *"The house became a design studio, I destroyed everything around me. But second semester came and I was, I guess more prepared, and I didn't want to live the same thing. I cared about my wellbeing, and that's why I took this step to try to make a distinction." (Participant D)*

> *"…that summer was very crucial to us because it was the summer we chose our majors. So, I was scared. I didn't know because product [design] is a really, really hard major. So, I didn't know if I wanted to continue in it. Especially with it being online. To me online was scary. There wouldn't be a professor there to... I personally learned from face-to-face more. So, basically there was a lot of change in aspects of prepping myself for this might not be face-to-face anymore. " (Participant H)*

Whereas the spring semester was characterised by being in a survival mode, the autumn semester gave rise to more creative appropriations and disruptions of the technological solutions we had at our disposal to create the design studio online. One explanation here could

be that both students and instructors intuitively engaged in preparatory work for play to emerge during the autumn semester. That is to say, developing new teaching content and means of engagement and mentally preparing for more active participation in the learning process seem to suggest work was put into ensuring the autumn semester could be more pleasurable and simultaneously less stressful.

Playing the Virtual Design Studio: Intentionality

While Sicart (2014) does not give primacy to any of the seven aspects of play, our data reveals how play being contextual and autotelic seemed to serve as the foundations for play to emerge. Having said that, not being autotelic did not prevent play from emerging, but it did seem to make it more challenging for the students to transition from being disappointed to being playful.

> *"But I feel like that was a low point because I know if I was on campus, I would have been able to do better. But it's just me being at home and coding all day was just too much to handle. I don't know, it took a lot of mental capacity, because I really don't want to do coding. It's not what I want to do, but it's part of multimedia so I have to go through it." (Participant F)*

> *"Even my friends from architecture school, they're all like, "Oh, it would be easier if we're studying business, but we need to do this in person and whatever," which, maybe there is truth to that, for example, using the Fab Lab, but it's not true. It doesn't really have to be fully in person to get the full experience. Maybe it's going to be a different experience, but that doesn't mean that you're not getting the full, I don't know, education that you're supposed to get. At the end, you're still going to learn, you're still going to be pushed to do things that you're probably not comfortable with. And that is what education is." (Participant C)*

Above, both participants were touching upon motivational aspects of learning about design online. Such reflections illustrate the critical aspect of intentionality and agency as they, to a large extent, enable the emergence of play. Thus, by exploring how technologies could be appropriated for creative purposes, the participants were actively experimenting on how to interact with each other and the instructor in this new context. Such a stance could be seen as a playful attitude towards online learning and conversely focusing on the limitations of online interaction as absence of playfulness.

Transmuting: The Virtual Design Studio Comes to Life

Although the initial assumption was that learning would take place online, our findings illustrate how students, often in carnivalesque fashion, appropriated and disrupted their immediate and not-so-immediate surroundings to better support their learning:

> *"We weren't supposed to use fabrics and stuff like that. We had to get something that we wanted to get rid of, like an article of clothing that we're not wearing anymore, whatever. And then we would unpick it and use the parts of that to drape on the mannequin. That part I started from home. I unpicked the shirt. And I remember I didn't have a mannequin, one of the things that I did is that I draped it on myself. But then for*

> *example, the backside, I wouldn't be able to do anything with it, because I'm using my body as a mannequin. There were limits to that also. But then I guess, because I was doing that, I took into consideration the bodily movements." (Participant C)*

> *"So, for example, if the professor says, "Okay, there's 10 minute break." I would mute my mic, and then go outside. And I know that the university stays within my computer. So when I go outside, I feel like, okay, I'm in the garden, or I'm outside. And if I want, I can bike for a bit, I can listen to the birds, I feel revived. And I know that university is on the computer, it's not everywhere. I think most of it is purely psychological. I could go out from the design studio and listen to the birds." (Participant D)*

The excerpts above reveal how students appropriated their surroundings, tailoring them to online education and to explore personal modes of learning. Due to the absence of mannequins, one student even used their own body as a mannequin, thus appropriating their own body to serve as an object in the design process.

Carnivalesque behaviour, understood as subverting conventions (Bakhtin, 1984), revolved around somewhat surprising interactions between the students, materials, and other people.

> *"It was interesting because I started helping them [parents] out and they would start helping me out. But I would help them with the tech stuff and they would help me with, say getting my routine in order. Because they would help, 'Okay, you need to eat before this time. And you need to make sure that you are exercising. You need to eat at the right times.' Because with studio, I would just skip hours and hours of food. Then at the end I would just be starving and I'm like, 'I need to eat.' And I would just eat anything that was in front of me. And they were like, 'This is wrong.'" (Participant A)*

> *"There were really a lot of failures. I tried to use wood and fire and I don't want to even explain how that went. I almost caused the house to go on fire. So, there were lots of failures, but I had to go through them to learn. So, it was fine. It was nice trial and error…I never saw my house as an experimentation lab until now." (Participant H)*

In the absence of the physical design studio, the students would explore new ways of relating to materials and other people, often resulting in laughter-provoking sensations. While almost causing a fire back home is not a laughing matter in the moment, in retrospect it was perceived as an invaluable learning experience. Similarly, because the design studio went online, students' parents would often bring food to them – something that would be quite unheard-of in a physical design studio.

Finally, there were also disruptive actions that brought the VDS to life. Here, emphasis was on breaking the usual flow of things to make the situation one's own, so to speak:

> *"I don't know if I'm supposed to say this, but for example, a lot of people when they want to present, they would turn off the camera and just take tweets from somewhere. I don't think it's necessarily a bad thing, because it would explain, especially for people that are anxious or whatever. Even us, as viewers, we would get a closer, or a better picture of what they're trying to say. I think it's fine, and I actually think that it made the*

> *presentations more interesting, less awkward, maybe, and a better experience, I guess, for the viewers and the presenter." (Participant C)*
>
> *"I like seeing different areas, different places, people walking around, maybe even animals, plants. Also, let's say the weather outside, if it's sunny and I'm able to sit outside, have my coffee and I'm able to think, I think that's very important to me than sitting in just one place not moving around." (Participant E)*

In essence, while in the physical design studio it is often the instructor that is in charge, in the VDS, students could also participate in setting the pace, thus disrupting and re-regulating the flow of sensorial elements at play. Disruption here does not mean something detrimental, but it is more about influencing how things could progress. Thus, disruption is often understood as arising from people appropriating the context.

Eroticise: Making the Design Studio Intimate

Drawing on Bell and Sinclair's (2014) understanding of eros (from which eroticism is derived) as relating to love, not sex or sexual pleasure, to eroticise the VDS means a personal investment towards oneself and others in order to make the learning experience an emotional, personal commitment (e.g. hooks, 1994). Thus, for the students to realise they have ownership of the learning process was something that emerged during online learning.

> *"I think, it was tougher for them because everyone views professors as just professors and not humans. You don't think that they would have any personal issues that you would have. Or they don't have anything to do they're just teaching us. But then when you see them online and these kind of disruptions come, you're just like, "Oh wait, it's just like me. Or just like my dad. Or just like my mom." I think it helped people understand that professors are also just normal people." (Participant A)*
>
> *"I was caught up on the fact that I'm missing out on the experience of touching the fabric and draping it and relate it to the body and stuff that. So I was kind of sceptical of it. But then at the same time, I think there is kind of relevance to the fact that I'm doing it digitally, where I'm doing online learning, and everything is digital. In fact, there was relevance for that specific scenario. I believe that gender is a social construct. And so we can try so hard to think of a shape that is not masculine, or not feminine, but then you don't have the innocent eye for it…A computer doesn't know about social construct, so it just would generate a shape based on the data that you give. And it was interesting to see the outcome of what is the shape that is 100% androgynous because it has both equal parts that are masculine and feminine, you know?" (Participant C)*

The excerpts above illustrate how the VDS enabled creativity and a more personal approach to learning to emerge. Realising that the instructors have more to them than their professional identities or utilising technology to explore gender as a social construct are examples of play becoming personal and creative. It could be argued that such insights surfaced from the students and the instructors collaboratively creating the VDS.

Synthesising the Aspects Through the Theoretical Framework

Findings here reveal how creating the VDS can be understood as an emergent act of play; by being playful, we partly leave behind the norms and assumptions of the physical design studio to create something new that blends boundaries (e.g. university – home, analogue – digital). Echoing Sicart (2014, p. 17), "to play is to make a world, through objects, with others, for others, and for us". Below (Figure 1), the VDS is seen as an outcome of collective play that is driven by individuals' playful attitude. As the differences between the spring and the autumn semester revealed, play was absent during the former while during the latter it was seen as a driving force, thus suggesting play has an important role when creating something new. In essence, play becomes a relevant theoretical lens in the absence of pre-existing structures and conventions that support the VDS.

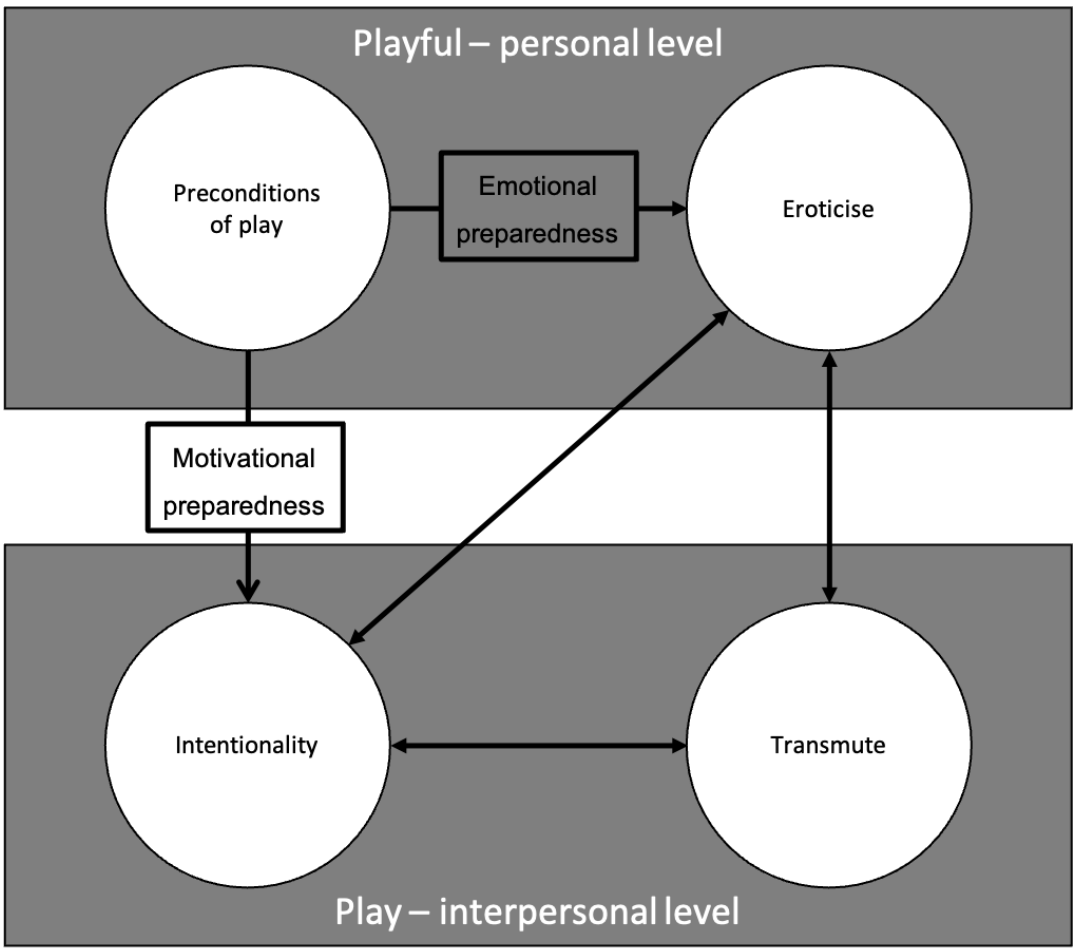

Figure 1. Theoretical framework explaining the emergence of the VDS.

The framework above does not assume play to be something fixed; once a state of play is achieved, it does not necessarily imply it will be sustained. Moreover, and here design education can provide theoretical inroads to our understanding of play since theories of play (e.g. Consalvo, 2009; Sicart, 2014, 2019) seem to suggest resistance and power to be external outcomes of play. In other words,

> *"playfulness is an expressive, appropriative, and personal engagement with the world that is nevertheless bound to goals and purposes that are not necessarily determined by the activity of play itself" (Sicart, 2019, p. 523)*

But what if these goals and purposes differ *within* the acts of play? While students and instructors can collaboratively engage in play, is engagement between individuals and over time static? As we observed during the courses we taught, at times we facilitated play and other times the students were more active. Thus, such absences give rise to bricolage of play: while individuals participate in the same VDS, play is temporally collaborative to a varying extent.

Building on the above, the framework shows the emergence of the VDS as a collaborative act in the absence of pre-existing norms and conventions. As such, being playful – having a personal commitment to teaching and learning – can be understood as a precondition for play. Whilst the intensity of playfulness can vary over time, it is the underlying personal commitment that sustains play and reveals how the VDS can serve as a site for learning about design. Above, we suggested that goals and purposes of play might differ within the acts of play in the design studio, and here the absences at the individual level play a role. While playfulness can emerge from the absence of something (in this case, for instance, the designated design studio), absence of play can also be understood, paradoxically, as a precondition for collaborative play so as to ensure everyone can participate in experiencing the VDS (in line with Sicart, 2019).

Discussion and Conclusion

Although many higher education institutions rapidly had to switch to teaching courses online during spring 2020, and while momentarily ignoring the impact it had on students' and educators' well-being, what we have experienced can be understood as a condensed opportunity in online education similar to that of Open University's journey in the UK (e.g. Cross & Holden, 2020; Garner, 2005). To this end, the research question we explored ("How do students and educators co-create the virtual design studio and how can this act of creation be theorised through the lens of play?") sheds light on the creation of the VDS as a manifestation of play. In the absence of pre-existing conventions, both students and educators engaged in play to create the VDS, thus extending Sicart's (2019, p. 531) notion of "playful resistance" to design education; upending technologies (both analogue and digital) to repurpose them for learning purposes. As such, we contribute to prior research on the VDS and teaching design online by illustrating how the VDS emerges when people appropriate technologies.

More specifically, prior research has argued for the benefits of teaching design online (e.g. Garner, 2005; Green et al., 2020; Jones et al., 2020; Lotz et al., 2019), and our findings support Lotz et al.'s (2019) claim that the VDS needs to be designed and simultaneously students need to be introduced to new ways of working. Here, we believe, mobilizing play as a theoretical lens allows us to see the VDS not as an encapsulated entity, but as a collaboratively created space through which "the relational strategies of play are shaping how the infosphere is experienced, and how cultures emerge from it" (Sicart, 2019, p. 532). With such a stance towards the design studio, we have the potential of both dissolving the virtual – physical dichotomy by not confining learning to predefined spaces and revisiting design education's signature pedagogy (Shulman, 2005). While such blending of boundaries might come with negative implications

(e.g. private becoming public and vice versa), findings covered in this paper provide fruitful avenues forward. For instance, by approaching one's home as a design studio through the lens of play, we could explore local and decentralized studios-at-home that broaden the collaboration networks amongst students, educators, and practitioners. Herein lies yet another peculiar paradox that might shed light on the future of the design studio: the absence of the design studio and its materials can give rise to networks of studios, thus highlighting how play can emerge in hitherto unknown ways.

Although the findings reported here increase our understanding of online design education, our study also has its limitations that can be utilised as avenues for further inquiries. While interviews enable in-depth exploration of phenomena, in this study we utilised interviews to explore past events. In terms of future research, there are potential avenues at the student, course, and institutional level. First, more studies are needed to explore the extent of play and playfulness in VDS (both in terms of methods and approaches). Here, studies informed by materiality and anthropology could be able to shed more light on how learning shapes and is shaped by play. Similarly, returning to the notions of absence and play, more research is required in terms of how the absence of taken-for-granted elements gives rise to play in design education, and similarly how play transforms signature pedagogies by resisting or questioning the taken-for-granted elements. Second, given that this has been an exploratory study, future inquiries could focus on how the spatio-temporal emergence of play shapes the VDS and how this reflects on collaboration over time. Finally, we also need more studies focussed on the institutional level: what kind of institutional practices prevent and enable educators to develop playful pedagogies for design education.

When it comes to pedagogical implications, our findings give rise to at least three promising avenues. First, the VDS should not be approached as an emulation or a stripped-down version of the physical studio. Instead, fostering a playful approach appropriates the surrounding environment, thus inviting experimentation from students and instructors alike. Second, the VDS is not only a digital experience; as such, educators can encourage students to see their surroundings as the design studio without investing in new equipment or materials. Here, educators can help students to create their own boundaries and practices to avoid home and studies to intertwine in a harmful way. As such, for play to emerge, some preparatory work is required. Finally, and in line with previous studies, it is becoming more and more crucial that we ought to emphasise community-driven learning. Group assignments, creating structures that help students get to know each other, and striking a balance between synchronous and asynchronous sessions all highlight the importance of dethroning the educator as the foci of the design studio. Students do not come to the design studio to bask in the educator's brilliance, we should focus on how we can learn from each other in a playful manner.

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"Scaling Up" and Adapting to Crisis: Shifting a Residential UX Studio Program Online

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Abstract
Our undergraduate UX program at Purdue University launched in 2016 as one of the first UX-focused undergraduate degree programs in the United States, intentionally designed to support the unique characteristics of a residential, research-intensive, land-grant institution. We designed multiple overlapping studio experiences that formed multiple connections among cohorts, supporting mentorship, cognitive apprenticeship, the construction of social bonds, and reflection on one's own development as a designer. Our program was experiencing quick growth, with our cohort size growing from 20 students in 2016 to 50 students in 2021. With the onset of pandemic restrictions, the challenges of "scaling up" and the challenges of building a virtual studio pedagogy thus met. Our "hidden curriculum" of peer feedback and tacit learning, critique as a means of socialization and feedback, emancipation of the self, and allowance for identity formation pointed towards studio properties that were central to our pedagogy and needed to be reformulated or rethought. I describe the resulting "dimensions of crisis" that impacted our pedagogy and practice, the new supports for studio learning practices that we designed, and how these changes may lead to lasting changes to our residential program once the restrictions of the pandemic subside.

Keywords
UX design; hybrid pedagogies; praxis; identity formation; critique; hidden curriculum

Introduction
Studio education has changed shape in the last two decades, impacted both by the increasing number of design disciplines that have emerged in relation to new technological capability (Faiola, 2007; Friedman, 2012) and the increasing profile and power of design in industry and everyday life (Kolko, 2018). While the roots of studio education—situated in the social and creative terms of the *atelier* or studio master—still live on in many art and design programs, there has also been interest in exploring how the "essence" of studio pedagogy might be adopted and adapted in other disciplinary contexts or emergent design disciplines (Gray, 2016). These emergent views of studio have prompted a range of points of reflection on what studio *is* (cf., Cennamo, 2016), what elements are core to or characteristic of studio pedagogy (Klebesadel & Kornetsky, 2009; Shulman, 2005), and if we can create a comprehensive list of the properties—that in whole or in various combinations—that define studio experiences (e.g., "recipes" in Jones, 2020).

While there are numerous and interesting challenges that have been experienced in traditional art and design disciplines relating to studio practices, ranging from financial pressures of austerity in the neoliberal university to shifting technological expectations to changing expectations around the power-laden roles of tutors and students, I wish to focus on the

uptake of studio in new design disciplines. Building on Buchanan's (1995) "four orders of design," new areas of design practice that reference—yet exceed—the outcomes defined by traditional modes of design that are characterized by their outputs (e.g., sign and symbol systems for graphic design; physical products for industrial design) are increasingly relevant and connected to the uptake of design as a strategic force in shaping our everyday lives. From the roots of interaction design in the 1990s in the Netherlands (Höök & Löwgren, 2021) to more recent attempts to define systemic design, strategic design, service design, and user experience (UX) design, among others, the world of design has expanded dramatically. Even so, the framing of studio pedagogy, particularly in the scholarly tradition, has remained relatively static, with practices still often bearing direct relations to the roots of the studio at *École des Beaux-Arts* or the *Bauhaus* (Cennamo, 2016). In this paper, I will seek to describe how a group of faculty at a large Midwestern US university built upon various elements of traditional studio pedagogy, adopted new models of engagement with students and disciplinary knowledge, and sought to explicitly engage with dimensions of power in the studio. I will use the dual tensions of "scaling up" a program in user experience (UX) design alongside the additional challenges brought by the COVID-19 pandemic to reflect upon the ways in which studio practices can support individual and instructor differences at scale as a *praxis*, claiming commitments towards inclusivity and accessibility while also challenging student and instructor expectations of rationality, power, and the role of design in supporting social change.

"Scaling Up" and Adapting to Crisis

Our undergraduate UX program at Purdue University, a large research-intensive Midwestern US university, launched in 2016 as one of the first UX-focused undergraduate degree programs in the United States (Gray et al., 2020; Vorvoreanu et al., 2017). We built upon a number of pedagogical philosophies, focusing our efforts on building a residential, studio-based program that incorporated several key features: active learning pedagogies, a supportive and emancipatory environment for student learning, and attendance to the social organism of studio engagement that would support students in learning to be and become successful professional designers. From the beginning, we envisioned multiple overlapping studio experiences that would form multiple vertical integration connections among cohorts (Gray et al., 2020). This vertical integration would then support mentorship, cognitive apprenticeship, the construction of social bonds, and reflection on one's own development as a designer. We proudly built out our studio-based program as a residential experience (although we did not have a permanent studio space of our own until Fall 2019), attempting to bring together the best of the traditional art and design studio environment, while also seeking to box out or limit the worst excesses of studio in these traditional contexts (cf., Anthony, 1991; Blythman et al., 2007). Put simply, our goal was to create a studio experience that was supportive, engaging, cohesive, and committed to the emancipation of students (Gray et al., 2020) as they became the type of designer that they wished to be in a discipline that was—and still is—under active negotiation and change (Kou et al., 2018; Lallemand et al., 2015).

We intentionally sought to limit common studio challenges around competition, rude or obnoxious behavior that took advantage of instructor power through a reclaiming and repositioning of the *hidden curriculum* (Dutton, 1991; Martin, 1976) as a force for good. In doing so, we leveraged the critically-focused notion of praxis (Varner et al., 2020) to describe not only which studio practices we wished to adopt that connected with our overarching values

and moral philosophy regarding design, but also the trajectory and directionality of these practices in informing new ways of being that could be adopted by students to inform their future practice. In the wake of concern regarding the reductionism of the *design thinking* movement (Kolko, 2018; Laursen & Haase, 2019), we also rejected "cookie-cutter" or "recipe book" approaches to design learning that allowed only one philosophy or perceived process of design to dominate, and instead built in opportunities for students to engage with multiple philosophies of design, including human-centered and user-centered design, participatory design, co-creation, digital civics, critical design, feminist design, and speculative design.

These were challenging pedagogical decisions to make, and then even more difficult to leverage to inform intentional changes to the learning experiences we designed for students to engage with these forms of complexity. By far, one of the biggest barriers to executing on a program that was explicitly not "one size fits all" was program size. Even before the pandemic's effects began to be felt in the United States in March 2020, as a program faculty we had been sitting uncomfortably with challenges to scaling up our studio efforts. Once the program was mature in 2018 with three overlapping cohorts, we used the vertical integration of three of our undergraduate studios to facilitate peer mentoring, critique participation, and starting in 2019, "shepherding," to allow for project teams to have a mentored experience that also contributed to feedback on their final documentation. These efforts had led to relatively high levels of cohesion and sense of community as reported by students in their weekly reflections on our Slack workspace, but still resulted in challenges in playing out the curriculum on a practical level. These issues of scale came to a head in January 2020, as we sought to teach 45 students in our introductory studio using a project-based learning approach that had been dreamt for 20 students back in 2016, and then productively engaging an additional 31 students at an intermediate level and 25 students at the advanced level through vertical integration. In the following sections, I will primarily focus on our introductory studio due to its large enrollment, but will also seek to connect some of this emergent complexity to other aspects of our pre- and during-pandemic instructional practices.

Identifying Dimensions of Crisis in Our Pedagogy as We "Pivoted"

In our introductory studio, we engage students in four collaborative projects across a 16-week semester. Our first project cycle began with two team members working collaboratively together on project 1 and ended with 4-5 team members working collaboratively on project 4. This organization of student teams meant that we had to identify ways to support 22 parallel project teams for the first project cycle—and then augment this support on projects with mentors from our upper-level vertically-integrated studios. This worked out well enough, but then we were suddenly confronted with other scaling challenges once we went fully online in March 2020. Many questions emerged as the pandemic news deepened: How do we maintain the socialization of students in the midst of an international crisis? How do we identify and support students who have issues of access and equity that may impact their learning? How can we manage to identify "hidden" areas of concern across so many students? How can we address differences in physical and digital participation that may privilege certain kinds of interactions by students with certain capabilities? How can we engage in forms of critique that were unfamiliar in our physical studio, but essential in the online pivot? How could we quickly assess the technological assemblages of Slack, Discord, WebEx, Zoom, and other communication tools and identify new means of supporting student communication, feedback,

and learning? And how can we support more than ten parallel project teams for our final project sequence with support only given virtually? All of these issues allowed us a new perspective on the studio culture we had been designing for four years at that point. What does a studio-based program look like when the physical studio is dark and unoccupied, students are spread across the country joining Zoom from their own homes, and the "buzz" of activity can only occur in less tangible (and perhaps less familiar) forms on collaboration tools such as Miro, Zoom, and Slack?

The challenges of "scaling up" and of identifying a pandemic-aware set of values for our studio culture thus met our "hidden curriculum" of peer feedback and tacit learning, continuous provision of critique as a means of socialization and feedback, emancipation of the self, and support for identity formation pointed towards key values that had become central to our pedagogy and needed to be reformulated or rethought. These resulting "dimensions of crisis" broadly encompassed aspects of our pedagogy and practice which we sought to take up in a reflexive, critically focused mode of engagement:

- Encourage means of socialization and management of wellbeing
- Discover new ways to engage in critique, both as a means of feedback and as a much-needed form of socialization
- Wrangle technology to allow for multiple forms of physical and digital participation
- Identify and support students that are adversely impacted by the pandemic
- Enculturate students into the culture of studio without physical presence

Managing Feelings of Grief and Redirection

This reintroduction of "wickedness" into our studio curriculum across these dimensions of crisis was challenging to manage—in fact, before the pandemic began, we had just begun to stabilize key parts of our studio practices after four years of active curriculum development. Not only did we have to find ways to help our curriculum and students "survive" the pandemic, we also needed to identify and balance—anew—the stressors we were placing on our students, determining whether these stressors were just, timely, and ethical. These design and pedagogical challenges came alongside our humanity as instructors; we were trying to manage the effects of the pandemic ourselves while also attempting to extend care labor to our students, many of whom were facing new forms of precarity relating to finances, physical health, or caregiving responsibilities.

Figure 1. Our studio space before the pandemic (left) and after the onset of pandemic with required social distancing and Plexiglas shields (right).

For me personally, this forced reshaping of the program came with feelings of grief which took many months to resolve. Grief because we only had one full semester in our newly furnished studio space, with the last of the furniture ironically delivered on the last day where classes were allowed to be held on campus, doomed to be unused for much of the year. Grief because of the additional barriers and uncertainty that I could see that our students were facing (and that we validated to form a response through an online survey in March 2020), and that we would need to consider alongside our course expectations. Grief because the assumptions we had baked into our pedagogy had to be identified, extracted, and in some cases, rejected—with no time to form a comprehensive or well-studied replacement. Grief at a greatly impacted student experience that for many of our students would dominate their five semesters of studio instruction. Yet this same grief also provided a path to reconsider and rethink studio practices that we as a group of instructors were just beginning to solidify. From pragmatic considerations such as not having printed out materials for each week of studio class that were just a filing cabinet away, to having to discover new digital tools to build and maintain classroom energy online, to finding ways to be inclusive and caring in aiding students who were forced to quarantine and isolate that moved beyond our traditional attendance and participation practices.

Reimagining Supports for Critique and Identity Formation as an Emergent Studio Praxis

Building Critique Assemblages

We began by considering modes of critique, since this area represented the largest departure from our physical studio practices. What had begun in our program as a more or less direct translation of the “gallery walk” and “pinup crit” from traditional design disciplines such as graphic design, in which I trained, had become unwieldy, uncomfortable, and perhaps even inequitable. While a gallery walk of 4-5 projects across 20 students early on in our program history was eminently manageable and even exciting for students, a gallery walk of a dozen or even more projects with more than 40 students directly prior to the onset of the pandemic had become a logistical nightmare. In the physical studio, we had run out of spaces for students to post their work on the walls and whiteboards, and a full gallery walk alongside report-outs from each team with questions took two or more hours to conduct. What had begun with the goal of

encouraging cross-pollination of project ideas among students had become stressful for students, with difficulty in maintaining student engagement and social energy.

Thus, when we were forced online and began to use digital tools like Miro (a collaborative digital whiteboard) to digitally post in-progress artifacts, I breathed a deep sigh of relief. What had been challenging to manage, logistically and socially in the studio, became almost second nature in digital form. In the weeks that followed, we tried several different permutations to replicate—or even reinvent—different aspects of desk critique, group critique, and final presentation critique (see fuller elaboration of these altered critique modes—what we call *critique assemblages* in Wolford et al., 2021). Students immediately noticed—and praised—these new forms of critique as less confrontational, more meaningful, and resulting in actionable feedback.

One permutation included a direct translation of the gallery walk into a Miro or Mural online interactive whiteboard (Figure 2), where students could add their work in advance of the class period (removing the shuffle of tape and magnets at the beginning of class in the physical studio), followed by a defined period of time where I played music through Zoom to allow students to review each others' work, and then capped off with brief report-outs and verbal questions to each team by students and the instructor. As I myself became ill during the Spring 2020 semester, I needed to find new ways to manage these critique events, while still ensuring that students received enough feedback to move their project work forward, leading to other inventions of critique assemblages.

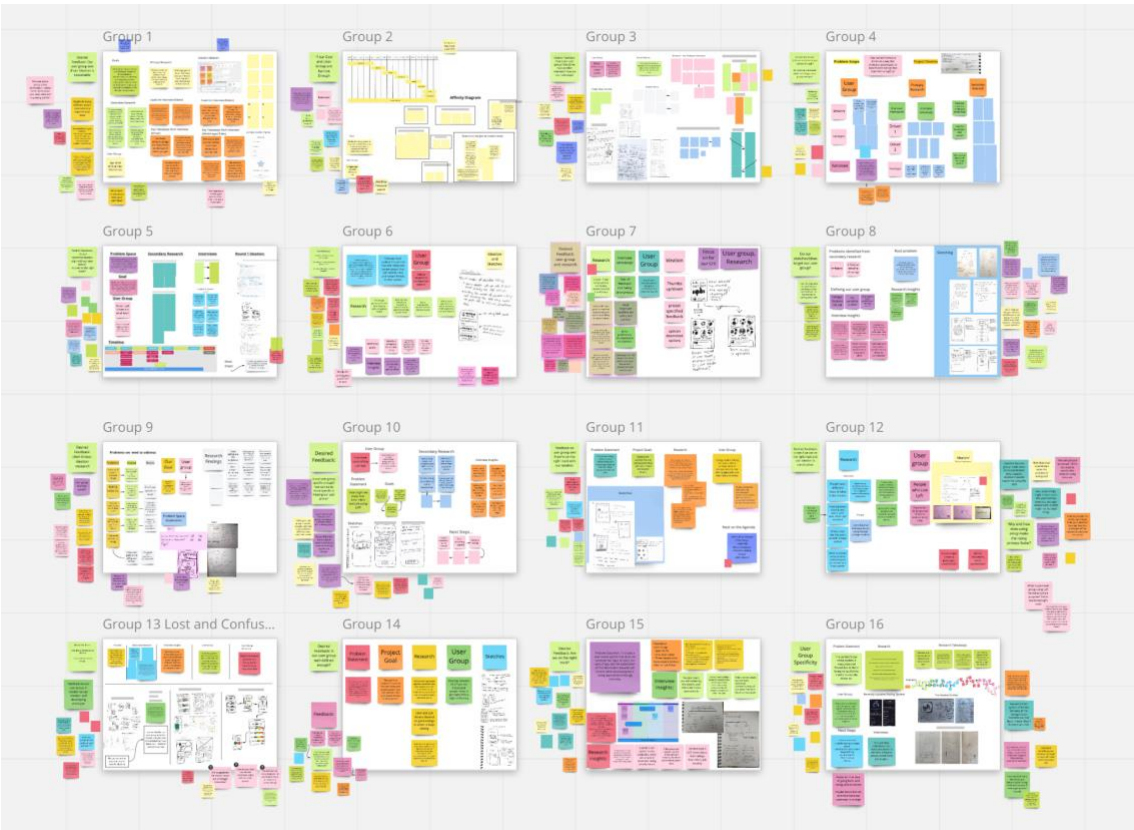

Figure 2. Artifacts of a group critique on Miro with notes surrounding each frame resulting from peer and upperclassperson engagement with each group's work.

In another permutation, I tried out an asynchronous framing of the group critique. Each team had a Slack channel where all students in the class were added, and in this channel, team members posted in progress artifacts (often as a short video) alongside aspects of their project that they wanted feedback on. Over a 48 hour period, all students in the course were asked to provide written feedback in the Slack channels of at least half of the project team, and then I added 8-10 minutes of audio feedback in each channel as well. This resulted in substantially more feedback that would have been possible in a single class period, while also giving less outgoing students an opportunity to frame and present critical feedback.

We also experimented with a live version of the gallery walk (prior to Zoom's capability for participants to self-select and move among breakout rooms), where each team launched a video call in their team's Slack channel, while half of their group members joined other team video calls to discuss project work and provide feedback. This framing of critique, too, added new levels of engagement and socialization in a time when many students were struggling with Zoom fatigue or a feeling of disconnection from classwork and fellow students.

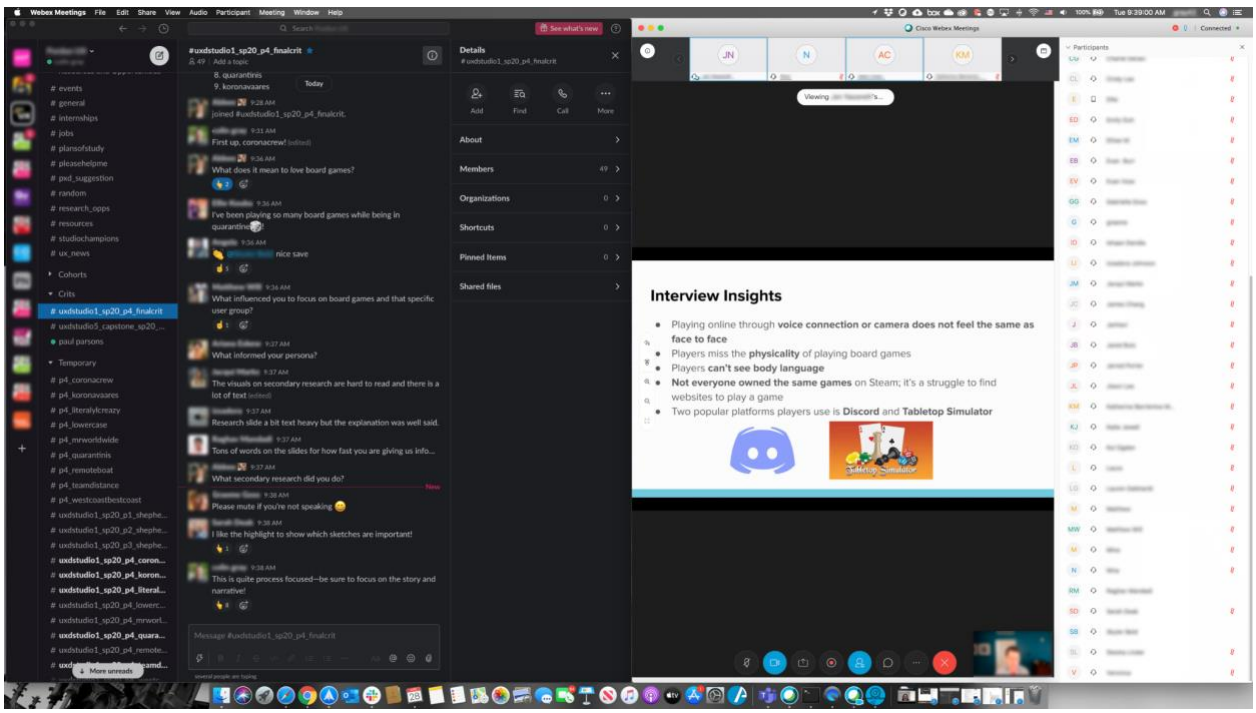

Figure 3. A final presentation crit with student participation via Slack and WebEx.

The most dominant critique events—both before and during the pandemic—were final presentations. Even when we met in person prior to the pandemic, we had used Slack to extend means of student participation, encouraging students and visiting upperclasspersons (students one or two years ahead in their program who had previously taken this studio) to add comments during and after each presentation (Figure 3). When we moved to fully virtual participation, the Slack critique became even more integral in reproducing some of the "buzz" of the physical studio, while also allowing more upperclasspersons to "fit" in ways that would not have been possible due to the physical capacity of the residential studio.

Supporting Identity Formation

The second issue that we sought to address was the allowance for deep identity formation and specialization—by considering how we used our studio time to engage in readings, discussion, and design work. In relation to these practices, our engagement with studio properties such as "active learning" and dialogical and constructivist learning were challenged. While in the immediate wake of the pandemic shutdown, we were merely seeking to *survive*—recognizing that participation could not, and perhaps should not, be the same as it was in typical years. However, as weeks turned to months, we had to consider how to encourage appropriate and meaningful levels of participation as we experimented with combinations of hybrid and synchronous studio sessions.

We continued to leverage a social reading tool called Perusall for asynchronous yet social engagement with readings. However, replicating reading discussions in a hybrid classroom with many students joining via Zoom, and other masked and socially distanced students joining in a large studio classroom presented unique challenges. Students online could talk amongst themselves easily in the group session or in Zoom breakouts, and they could be easily heard over the speakers in the studio. However, students in the physical studio often struggled to speak loud enough to be heard online, even with a high-quality omnidirectional microphone in the center of the room.

As an instructor, I resorted to wearing a wireless microphone to be audible online, with varying levels of success in the classroom. This created a situation where meaningful questions and conversation were often coming only from the students joining via Zoom, and students in class had to resort to awkward conversations in person separated by distance and audibility concerns. And from an instructor perspective, this cyborgian arrangement of technologies—an iPad to stream my face and the whiteboard; a wireless mic strapped to my face in front of a double mask; a computer with a webcam connected that faced the students; a mounted TV streaming from the iPad Zoom display to allow students on Zoom to have a physical presence in the studio; and an omnidirectional mic that had to be manually switched to allow students in the physical studio to be audible—caused substantial strain from an instructional perspective, making these studio sessions exhausting to run with limited perception of value in terms of student engagement.

Shifting to New Modes of Enculturation

Due to these challenging—if not fully failed—efforts at hybrid engagement in Fall 2020, we moved to fully online synchronous instruction in Spring 2021 to enculturate our new cohort of 50 undergraduate UX students. This move allowed us to focus on socialization and participation without managing a hybrid experience that tended to disadvantage students joining in the physical studio. The timings for the course—including two three-hour sessions per week—were left unchanged from our physical studio approach, even though we may have considered other ways of utilizing time and synchronicity in a non-emergency setting that would have been less onerous for instructors and students alike. The all-virtual approach for the first eight weeks of the semester allowed us to further leverage the digital tools, such as Miro, that we had come to rely on in the pivot to pandemic learning, adding other mechanisms such as a "reading panel" to incentivize student engagement and provide social structure as well. To form the reading panel, we had students sign up for one day in which they would be one of 3-4 students that

would be our lead participants, with the responsibility of coming to class with questions, leading conversation, and ultimately helping me avoid the awkwardness of "dead air" on a three-hour Zoom call. While in theory, this panel would enable me as an instructor to be more present and conversational, facilitating social support that would likely be useful in a post-pandemic physical studio as well, student exhaustion and Zoom fatigue still often took its toll. Students on the reading panel for that day participated actively at the beginning of class, but quickly regressed into less visible forms of participation.

While the studio in hybrid or fully virtual form often lacked the "buzz" of a traditional residential studio, students did stay engaged in other ways that had previously been relegated to the background. In particular, students' engagement in weekly written reflections on our course Slack workspace became increasingly important. Because I did not impose a structure on these reflections, students used the space to consider the impacts of the pandemic on their personal and social lives, their increasing knowledge about design, and their collaborative experiences—building a space where they could let their guard down and recognize that they were not alone in experiencing the unique challenges of learning during a pandemic. Due to the lack of more explicit audible communication, this written record—alongside occasional structured reflections in class—foregrounded the students' care for their community and provided a space for them to be *human* in the context of studio learning, not just a design student.

Conceiving and Changing Our Notion of Studio as a Praxis

As I reflect upon this year of change and the unique characteristics of our studio program, I have increasingly considered the role of our values and means of engagement as part of a studio *praxis*. The notion of praxis allows us to consider not only our instructional practices in isolation, but also the intersection of these practices in relation to power, privilege, engagement, and care.

The level of engagement, care, and participation we have experienced in online modalities has allowed our program to successfully scale, while still attending to some of the key elements of studio that we were struggling to scale in a physical space. Student engagement in various forms of critique in virtual settings has kept pace with the amount of feedback provided in physical studio, but now with a digital "trace" that keeps the feedback alive for future reflection. The recording of studio sessions using Zoom has allowed students to have the option to reflect upon the discussions, with more support for accessibility through automated transcription. While I did not track viewing history for these recordings, anecdotally, some students did take advantage of revisiting class sessions during the 30 days each recording was available. Beyond recordings, the use of digital augmentations to support reading discussions has allowed for entirely new ways of engaging beyond the spoken word—likely allowing a whole new set of students to thrive in a virtual studio that may not have done so in a physical studio environment.

What is unclear is how to create a synthesis of these approaches. We will return to physical studio instruction, and we will engage again in some of the physical studio practices that are in some cases centuries old. But what are we willing to replace, and with what justification? What aspects of the "studio organism" are we seeking to feed or better support as we make these

choices? What might a critical view of studio pedagogy (e.g., Dutton, 1991; Gray & Smith, 2016) impart when acknowledging at a deep level the impacts of pandemic and crisis on our learning experiences? If emancipation is central to our practice, as we had previously claimed in our guiding principles as we originally constructed our program footprint, how might we use this pandemic experience to cull away practices which are past their sell-by date and leave ourselves open to discovering new types of practices or new physical-digital assemblages of practices?

I will conclude with some examples of these productive yet challenging tensions that illustrate the levels of complexity of our praxis that we will need to continuously grapple with in the coming months and years:

- **Formative critique in group settings is clearly easier to manage at scale in an online environment.** Asynchronous versions of critique practices using Slack channels with the entire class invited to each project team channel facilitated deep and extensive feedback when opened for a 48-hour period, while Miro-focused group critiques added additional flair and depth to the content being presented, but perhaps increasing the amount of strain to read and respond to materials in depth at scale. The online iterations of formative critique generally felt more accessible for students, and more voices could be "heard" through Post-Its than would have been possible in the physical studio with verbal questions. Thus, while the performative quality of gallery walks and other forms of formative group critique are useful as enculturating tools, it's possible that we may never do a full-scale gallery walk with 40+ students in the same way again in the physical classroom. This element of our praxis points towards issues of equity and accessibility that we had perhaps neglected in previously instantiations of our physical studio.

- **Desk critiques in both environments have different strengths which could be exploited.** While the classic desk crit in a physical studio benefits from the power of "overhearing" in physical space, these benefits are reduced to virtually zero in studio environments containing dozens of students due to the din of dozens of simultaneous conversations. In online settings, there is the opportunity for a better "push/pull" balance to students' engagement in desk crits, where students can more actively identify the need for a crit and represent that choice in a democratic and visible form on our class Miro board. However, when these crits are in process in individual Zoom breakout rooms, there is little to no ability to share out those learnings to the broader group without new patterns of documentation and sharing. This element of our praxis presents tensions in relation to student autonomy and agency, while also providing new ways of considering power relations and feedback when engaging with student teams.

- **The online learning environment lends itself to easier documentation of learning artifacts and outcomes.** While we had recorded critiques for years using GoPro cameras, the use of Zoom recordings provides much better audio quality, enhancing these online-focused records for future reflection. I had previously recorded all of my class sessions on my smartphone for my own use for recall, but the ability for all students to productively use class recordings for further study or use has raised

recording as potentially another area where studio equity can be enhanced. This element of our praxis raises important questions regarding accessibility of learning experiences, pointing towards ways in which improving accessibility may also positively impact other forms of reflection and engagement with course content.

- **The metadata layered on top of the studio learning experience, and its value to enhance and facilitate reflection-on-action, is an open space for new work.** The challenges of aligning the physical and digital studio worlds is something I first faced in my dissertation research (Gray, 2014), and this opportunity space—in part—informed our use of Slack to create a social and engaging space for students to build their own sense of studio. However, these worlds have not quite met—yet. How might metadata from Slack and other forms of online engagements creep into the physical space? Where are there opportunities to leave open threads of engagement that begin in the physical space and end in the virtual space, and vice versa? How could students more effectively leverage their past "metadata" (including all reflections, project feedback, mentored feedback, reading annotations) as a tool both in developing their expertise as a designer and as a future boundary object for further learning and education of coworkers? This element of our praxis reveals new forms of engagement that may enable a wider range of students to be able to fully participate, and also extend learning opportunities for students already well served by our residential studio.

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Here's What we Really Want your Class to be about! A Design Thinking Class Responds to the Pandemic

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Abstract

This case study describes many changes to the curriculum of a design thinking for social innovation class at a private university in New Orleans that were prompted by the COVID-19 pandemic. The pre-COVID version of the course offered a practical, experience-based introduction to design-thinking (DT) tools and methods. Students learned to apply these tools to social innovation for collective impact through discussion, studio and fieldwork, and close collaboration with colleagues and members of the New Orleans community. The challenge during the COVID-19 pandemic was how to re-create this experiential learning while working remotely. The paper aims to demonstrate how the pandemic-related changes such as the all-remote delivery of instruction, community involvement, as well as a change in philosophy due to the racial unrest in the United States in 2020 led to a re-design of the class. The theme of the class, Sustainable Development Goal #3, "Good Health and Well-being'' was requested by residents of New Orleans, in light of the impact of the pandemic on communities of colour in the city. Despite being a remote class, the residents were also present in the class regularly throughout the semester. The remote delivery of the class forced a need for intentional and empathetic community building among the students and with the community members. The redesigned class included conversations about race, periodic drop-in visits from community members, guest lectures from professors in other cities, feedback sessions via social media, and critiques by panels composed of community members and visiting designers from around the world.

Keywords

remote learning, design thinking, emancipatory community-based learning, critical pedagogy,

Introduction

> *"You people are always coming here and telling us what you want to do in our community, well it's 2020. Here's what we really want your class to be about!"*

The COVID-19 pandemic and the social unrest in the United States prompted many changes to the Fall 2020 version of the Design Thinking for Collective Impact course, a course within the Social Innovation and Social Entrepreneurship minor at Tulane University.

In summer 2020, the world seemed to be falling apart. Students, faculty, and the residents of the city, like people in other parts of the world, were living through collective trauma. What content could make sense considering the chaos that the COVID-19 global pandemic had caused? 2020 was also marked by many protests against racism in the United States in the wake of the murders of George Floyd, Breonna Taylor, and Ahmaud Arbery. The setting for this case study is New Orleans, which is a majority-minority city in the southern United States, and,

although almost 60% of its population is African American, Tulane University is a predominantly white institution in New Orleans (Williams, 2021). The unrest of 2020 brought these racial tensions into the classroom. How could the students sensitively and respectfully engage with the residents given the impact of both incidents on communities of colour? How could the structure of the class honour the experiences and knowledge of the community partners? Could a design class in Fall 2020 just be 'business as usual' given the context?

Background

Design thinking is generally thought of as a creative problem-solving process that borrows processes and mindsets from the field of design, such as thinking intuitively, recognizing patterns, expressing ideas through means that go beyond verbal and traditional methods. (Razzouk and Shute, 2012). Many institutions have created design thinking programs for non-design students, as a way of exposing them to core design thinking abilities. For example, the UVA Medical Design program exposes medical students to clinically relevant design thinking skills such as empathetic interviewing with patients to deeply understand their motivations. Some UVA medical students indicated that the exposure to different approaches to problem solving through design thinking positively impacted their learning in medical school, and graduates have continued to apply design thinking approaches in their medical careers after graduation (Trowbridge et al., 2018).

The Design Thinking for Collective Impact (DTCI) course at Tulane University, assumes no prior background in design, graphic arts, or fabrication. It is open to admitted/declared undergraduate students of the Social Innovation and Social Entrepreneurship (SISE) minor who have passed the prerequisite courses. Though it is housed within the School of Architecture, the SISE minor at Tulane University is an interdisciplinary minor for undergraduate students from across the campus. Five, full-time undergraduate schools make up Tulane's Undergraduate College: The School of Liberal Arts, the School of Science and Engineering, the School of Architecture, the A.B. Freeman School of Business, and the School of Public Health. Therefore, the students in the design thinking class can come from any one of these schools. Most of the student population for the DTCI course in Fall 2020 comprised students who would not consider themselves designers.

Context

Design Thinking for Collective Impact at Tulane University

The DTCI course, as mentioned earlier, is located within the SISE minor at Tulane University. Both the DTCI course and the SISE minor build on Tulane University's strengths in civic engagement and service learning. Since 2006, students from Tulane University have contributed 2.5 million hours of service to the community of New Orleans (*Center for Public Service* |, n.d.). SISE courses introduce students to concepts of social innovation, mindsets of human-centered design, and frameworks for social impact leadership. Students in the minor develop an understanding of complex problems while developing a toolkit to create positive social and environmental change. This course, like several others at Tulane University aims to provide students with skills to create a more just and equitable society.

The city of New Orleans and Tulane University have an ongoing relationship through research. There are few studies about over-researched communities (Sukarieh and Tannock, 2012). New

Orleans, as a majority-minority city that experiences frequent crises and with its resilient residents. as well as the proliferation of academic institutions in such a small city, make it a prime location for having over-researched residents (Neal et al., 2015).

Provocation

Ms. C reached out to the professor during the summer of 2020 pointing out that the university would normally reach out to her and members of the community outlining what the research interaction would be in the upcoming semester. For the upcoming semester (Fall 2020), she wanted to have the community needs drive the direction of the class and the research, given the impact of the pandemic on communities of colour and the heightened awareness of racial injustice in 2020.

Ms. C's provocation or invitation hinted at over-research or 'research fatigue', which is a phenomenon that occurs when participants have had enough of the research engagement, impacting participant enthusiasm for future research (Clark, 2008). One benefit of over-research, however, is that it leads to experience and expertise in dealing with researchers (Neal et al., 2015), which Ms. C demonstrated as she gently demanded that the focus of the class meet the community needs. Ms. C. explained 'The COVID-19 pandemic has hit the African American community so hard. So, me and Ms. H. decided your class should focus on good health here in New Orleans, so after this pandemic, the people of New Orleans would know how to take better care of themselves after being hit so hard."

Ms. C., therefore, proposed a theme that was relevant to the crisis that everyone, professor, students, and residents, were experiencing. The proposal of the theme by the resident was one of the preliminary changes to the content of the course. In teaching design for social innovation, there is often tension between the needs of the community participants and the pedagogical needs and outputs of the class. Ms. C's allusion to over-research emphasized a need for attention to the process of research and how the outcomes are achieved over the resulting artefacts and outcomes (Kelly, 2020).

The pedagogical benefit of the provocation and the specific social context of 2020 was that it emphasized the need for situated and contextual learning for the learning to remain relevant for the students and the community participants. Situated teaching and learning is a feature of critical pedagogy. Teaching and learning that is situated learning in the context and culture of the students, shifts the focus from the teacher to the student, (Shor, 1992) creating a more student-centred environment and a more empowering and engaging educational experience.

The Pandemic Impact on Delivery and Content

The challenge during the COVID-19 pandemic was how to re-create experiential learning while working remotely. The in-person version of the class had a highly collaborative and relaxed studio atmosphere. The studio space included whiteboards, prototyping carts with post-it notes, markers, crafty materials, and tools. The class involved a lot of physical activities including physical warm-ups such as dance and games to get people moving when the energy was waning. Sometimes there would be music playing in the background while students worked. In-person classes in Spring 2020 were abruptly interrupted by the pandemic, and the

course content had to be rapidly modified to complete the semester. The summer break created space to build the online experience more intentionally.

The class had been designed with this relaxed studio atmosphere with games, music, and playful conversations, as regular components of the course delivery, not merely to entertain students, but to intentionally create empathic connections between them that would accelerate the group collaboration. Empathy is often noted as important to the design process, and this is often presumed to mean empathy for the users of the design solutions (Devecchi & Guerrini, 2017), empathic relations within the team are also needed for collaboration (Akgün et al., 2015). The recreation of the class online had to incorporate the social nature of the studio that promoted empathic and relational interactions.

The original class had been built around principles of critical pedagogy. While going through the design process, students also viewed material that 'problematized' the methods that they were learning to use, such as critiques of design thinking (99U, 2018; Ersoy, 2018; Martin, 2019; Wodtke, 2020), whiteness in design practice (Kelly, 2020) and resources that proposed improved ways of practicing design such as equitable design practice (Harrington, 2019), and a greater focus on systems (Joffres, 2020). The semester would end with their critical reflection on whether they agreed or disagreed with the perspectives that were oppositional to design thinking. In this Freirean way of analysing material that 'problematized' design thinking and proposing new models of design thinking, students would be more confident and empowered in their future design practice (Freire, 1973).

Given these considerations, the following were questions that informed the development of the SISE 3010 class in Fall 2020:

1. How to recreate the studio environment, conduct fieldwork and maintain engagement in a less flexible online space? (delivery)
2. How to build a class that would meet the social and affective needs of the students and promote empathic and relational collaboration between students who are collaborating remotely? (relationality)
3. How could the design class honour the collective pain and trauma of 2020 that impacted all of the stakeholders in the design project? (relevant and situated content)
4. How to build a participatory, community-engaged design class, despite the requirements of social distancing and or remote delivery. (community engagement)
5. How to ensure that the critical framing of the class would not be lost due to the revised delivery, or how to make best use of remote delivery to complement the critical framing of the class? (critical consciousness)

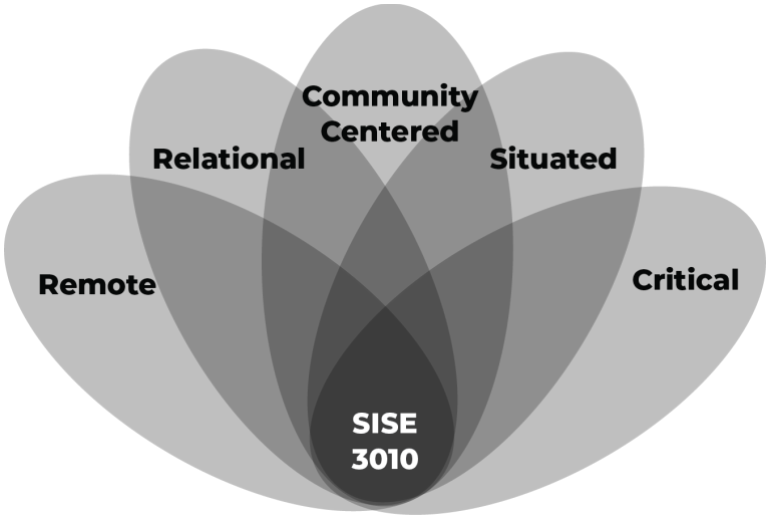

Figure 1. Conceptual Framework for the re-design of the SISE 3010 course. This image demonstrated that professor's mapping of the key issues to maintain in focus in the re-design of the course. The framework adds 'remote' to the previous core goals or concepts of the course of delivering a design education experience that is relational, community-centred, situated, and critical. Source: The author.

A Revised Class Design

The pandemic-related changes such as the all-remote delivery of instruction, community involvement, as well as a change in philosophy due to the racial unrest in the United States in 2020 led to the redesign of the SISE 3010 class. The new design sought to address issues of relationality, community centeredness, situated content, criticality and remote delivery. The overarching theme of the class, Sustainable Development Goal #3, "Good Health and Well-being'' was requested by residents of New Orleans, in light of the impact of the pandemic on communities of colour in the city. Even though the class was remote, the residents were also present in the class regularly throughout the semester. The emancipatory approach of making the class responsive to community interests and having residents present at each phase of the project, was a new approach that reflected a shift in philosophy towards centring the experiences and expertise of black people. This approach was developed as a response to the racial unrest in the United States in 2020, and the impact of the COVID-19 pandemic on black communities in the United States.

The remote delivery of the class forced a need for intentional and empathetic community building among the students and with the community members. The redesigned class included the warm-up and ice-breaker activities of the original in-person class, but also included conversations, readings, and reflections about race, privilege, and positionality, to help students understand their complicated position as students from a predominantly white institution doing research in a majority-minority city.

Though the class was all remote, students engaged with visitors and members of the public at each stage of the design research process. A guest lecturer who was a food anthropologist visited the class remotely to share strategies for building empathy and conducting interviews remotely to facilitate the remote research engagement that they were required to do with

residents. Students also practiced these techniques in class before doing the fieldwork. Students continued to engage with the public through the interviews, periodic drop-in visits from community members, feedback sessions via social media, and critiques by panels composed of community members and visiting designers from around the world.

Virtual whiteboards and video conferencing facilitated remote collaboration and learning throughout the semester. The video conferencing presented an unanticipated barrier to interaction with the residents. Audio and video challenges were experienced during the interviews conducted via video conferencing in Module 2. Students had to switch from internet-based video conferencing to cellular-based telephone calls to make the process easier. This however impacted their ability to record the conversations and save the auto-generated transcripts.

Description of Class

The 3-credit course was divided into six modules running from mid-August to the end of November. Some activities were module-specific while other activities continued throughout all six modules to provide rhythm and continuity. The class met virtually two times a week for 1hour and 50 minutes each session. Students worked synchronously and asynchronously in groups and individually responding to weekly prompts.

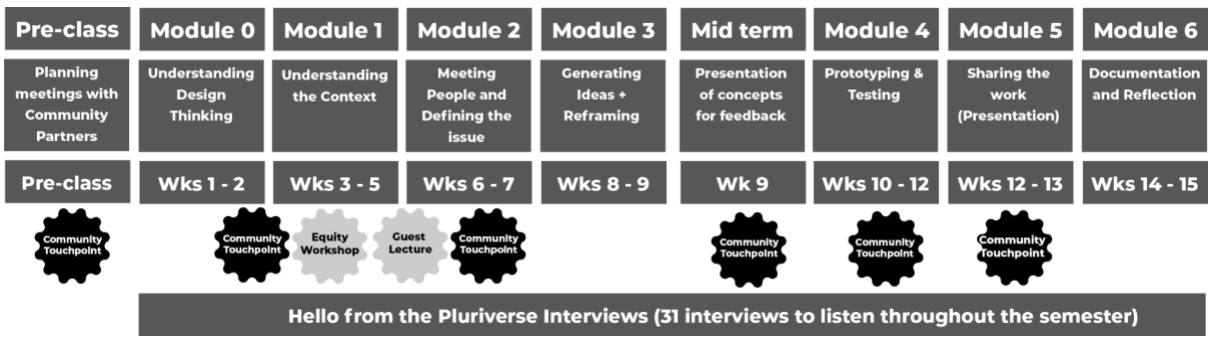

Figure 2. Week by week plan for the semester for SISE 3010 - Design Thinking for Social Impact. Source: The author.

Approach

This paper is a rich case study with reflection and lessons learned. The paper aims to describe, organize, and examine the many changes to the curriculum, that were derived from these two historical events, and understand how these changes impacted the delivery of the course and the student and community partner experience. The two main questions that were addressed in creating the course were: a) how to create relevant design thinking curricula situated in the public health and social justice crises of 2020, and b) how to create design curricula that despite the remote delivery, continued to focus on empathy, relationship-building, action research and fieldwork.

The Case

Actors

The theme for the class was proposed by two African American women from New Orleans, Ms. C. and Ms. H. There were fourteen students twelve of whom identified as female, and two of whom identified as male. Twelve of the students were white, and three were non-Black people of colour. Except for one student pursuing a bachelor's degree in Architecture, the students had no previous background in Design. Only one student was a native of the greater New Orleans area. Other students came from other parts of the United States. The professor was a Black woman who was not native to New Orleans or the United States.

Pre-Class

The professor and Ms. C and Ms. H met in person and virtually several times before the start of the semester so they could clarify the needs and expectations from the community participants and from the university. They also discussed the technical logistics of doing remote research. They considered spaces that residents and students could meet in a socially distanced way, as well as the technology that residents would have available to them for virtual communication. Due to the university's requirements, it was decided that all of the activities with residents would take place remotely.

Whole Semester Activities

Two activities took place during each session of the class to create some continuity in the experience. Each day either the professor or an assigned student led a short warm-up or ice-breaking activity to encourage students to feel more comfortable with each other. In this way, students also built their own skills as facilitators. This also created an environment conducive to co-learning, as the students designed their own warm-up activities, or built on games they had played as children, and everyone learned from each other.

The other activity that continued throughout the semester is that at the end of each class students had to listen to an interview between a designer and a student from a previous class. Design and design thinking can be perceived as very White, male, and Euro-American, just as the people they are designing for are also perceived as white, male, able-bodied and cis-gendered (Costanza-Chock, 2020). The 30+ interviews were recorded with designers from several different countries and with very varied positionalities, such as diverse racial and ethnic identities, native languages, gender identities and even professional backgrounds. The aim of these interviews was to broaden students' perception of 'who is a designer' and what is 'the design process'.

Modules

Module 0 - Understanding Critical Design Thinking

In this module, students were introduced to the remote platform Mural, a digital workplace for visual collaboration (Mural, n.d.). This module began with conversations about positionality so the students could reflect on their own identities and how they could impact the design research they were about to engage in. They used the Positionality Wheel pictured below, as a means of sharing elements of their identity anonymously and remotely. The Positionality Wheel was created by the author in 2019, and has been published previously (Noel & Paiva, 2021). The

Positionality Wheel was initially created as a tool for individual and group reflection in-person. The remote use of the tool allowed for greater anonymity which led to more sharing of identity features, which participants might have been inhibited to share in an in-person setting. The activity was followed by discussion and critical reflection. The aim was to help students see elements of their individual and collective identities that they might not normally consider so that they would also be able to recognize the subjectivity involved in the research and design decisions that they make. Students were introduced to the sustainable development goals and in particular SDG #3 Good Health and Well-being. They did a rapid design sprint to understand the process they were likely to follow over the next several months.

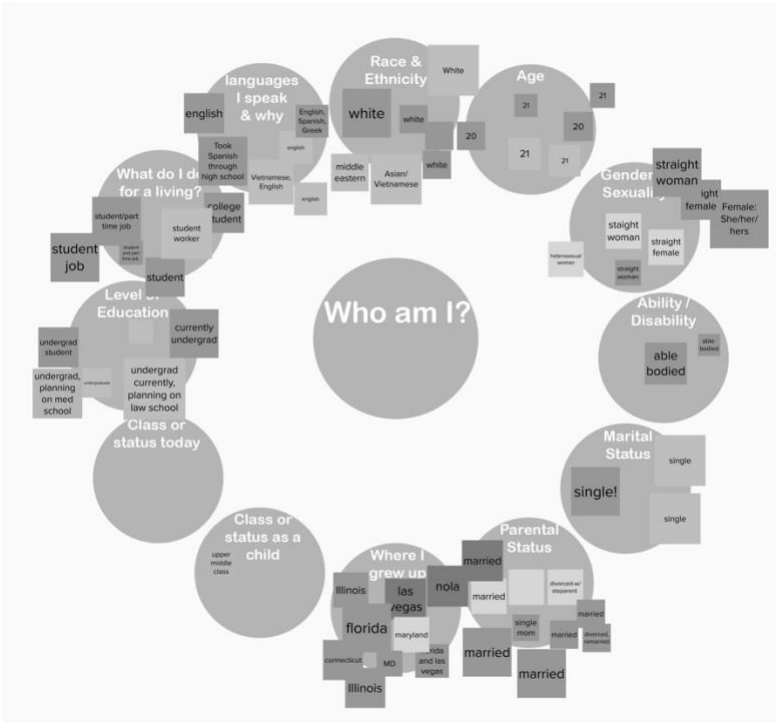

Figure 3. Group positionality using the Positionality Wheel. Source: The author.

Module 1 - Understanding the Context

Students were introduced to the question that had been suggested by Ms. C. and Ms. H. This question was "How Might we support New Orleanians to have better access to good health and wellbeing?" Students mind-mapped their understanding of Good Health and Well-being. External consultants provided a facilitated workshop about equity. A guest professor, who was familiar with New Orleans, gave a lecture about anthropology and strategies for understanding the research topic and connecting with the interviewee. He also helped the students craft possible research questions. Students met with Ms. C. to understand her view of the problem. She shared with them some pain points and points of joy about life in New Orleans. They listened for possible research questions in the open-ended interview. They also listened for possible desirable solutions being proposed by Ms. C. They noted additional questions which they would try to explore with the other interviewees (Figure 4).

Module 1 ended with preparation for the fieldwork which would happen in the next phase. This preparation took place by interviewing their classmates to understand hopes, joys, fears,

dreams, and Utopian ideals about good health and wellbeing. They asked three food-specific questions as ice breakers and as a means of collecting additional qualitative data. These questions were a) What food reminds them of home? b) How is a favourite meal cooked? What's the recipe? c) Describe how do the main ingredients get from the farm to the table.

Students worked collectively on their research at this phase. They collaborated by interviewing each other to practice interviewing skills, by researching the problem focus together, and finally by conducting the interviews in small groups.

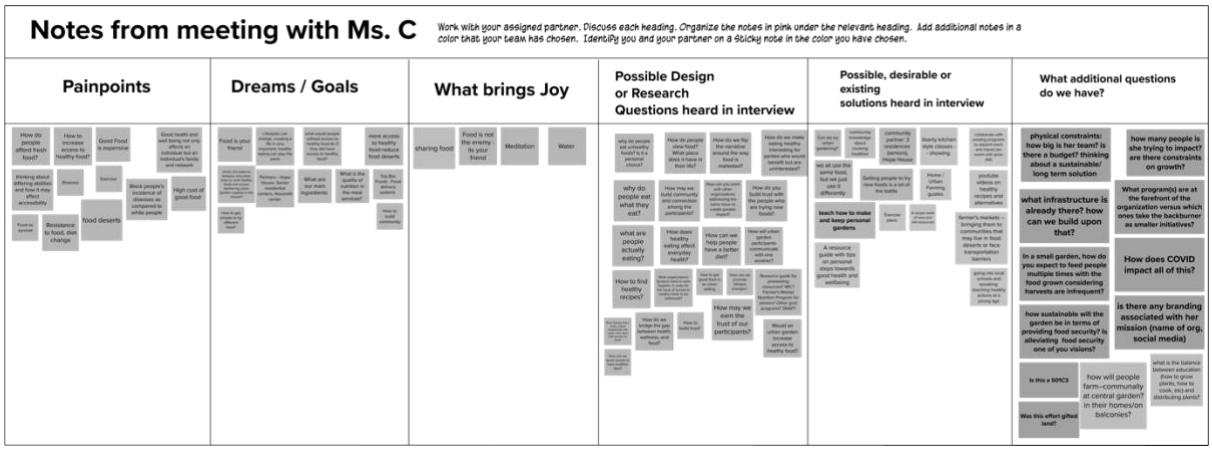

Figure 4. Group notes from the visit with Ms. C where students listened for pain points, dreams or goals, points of joy, possible solutions and other key points in the conversation that could impact the design process. Source: The author.

Module 2 - Understanding the People and the Main Issue

Students received additional coaching on conducting interviews. They conducted interviews remotely with three people. This was a difficult activity since it was evident that the varying bandwidths available to the interviewees impacted their participation in the interviews. The preferred interview method was to conduct the interviews via video platform since these could be easily recorded and would result in auto-generated transcripts. One person who had agreed to be interviewed, had to join via phone, because they needed to run errands during the scheduled interview appointment. They joined the video conference from their phone but eventually, the call dropped, and the person was unable to re-join. Another person could not join the video conference via their phone since they did not have enough data available on their telephone plan. The group conducting that interview had to switch to an interview via telephone instead. Finally, the third interviewee was able to join the video conference, but the sound quality was very bad, and this affected the students' ability to understand what she was saying. A fourth person had to be interviewed since the participant who was running the errands never completed their interview. Despite many challenges, all three student groups managed to complete their interviews. The class debriefed the difficulties of remote interviewing and was reminded that even in an in-person context, fieldwork can be difficult.

They translated the data from the interviews into personas as a way of anonymizing the information (Figure 5). The three personas they created were Beth, Megan, and Mark.

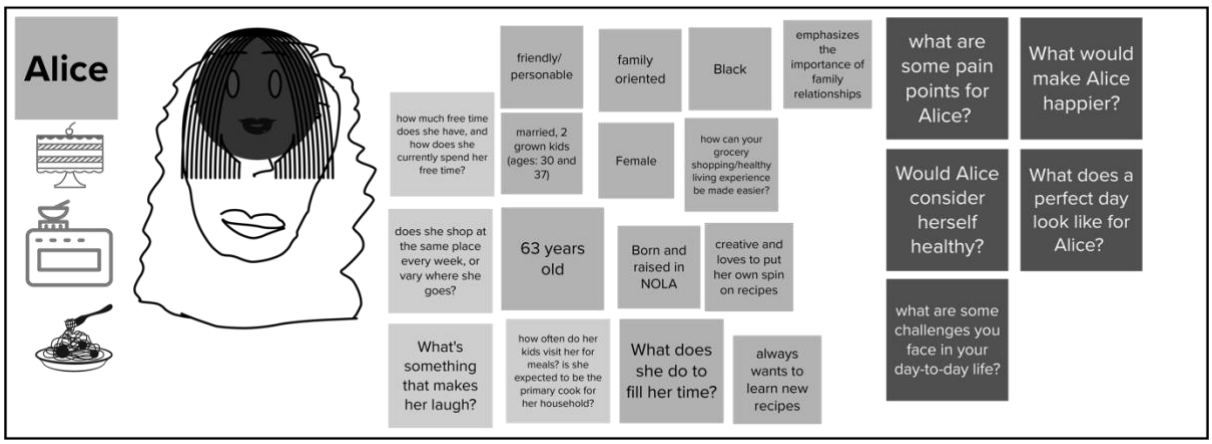

Figure 5. The group co-created a persona to represent the needs and concerns of the person that they interviewed. The students used the drawing tools and images available on the Mural platform. The illustration is not actually representative of a person, but drawing a person and using the emojis were part of the experience that helped them visualize the information that they had heard in the interviews.

Multiple Techniques for Problem Framing

In Module 2, after students had gained a better understanding of the context, there were many exercises to help students re-frame the problem. One of the activities was for students to brainstorm about "What if" questions and scenarios that could help reframe the problem and lead them to imagine new possibilities (Liedtka et al., 2014; Kimbell, 2019). They used the "What if dream space" to re-imagine the problem without many of the barriers related to poverty, time, access, among other factors. They created these questions and scenarios based on points that they heard in their interviews.

In another problem framing activity, students were asked to reframe problems through eight specific lenses (Table 1): Building networks, Activism and organizing, Knowledge sharing, 'Fixing', Making / Producing, Individual or public education framing, Agency and empowerment, Gathering or bringing people together.

Table 1. Alternative frames used for the class assignments.

Building networks	Activism and organizing
Knowledge sharing	'Fixing'
Making / Producing	Individual or public education framing
Agency and empowerment	Gathering or bringing people together

These eight reframes were intended to help students explore the same issue through several lenses. The "fixing" frame was borrowed from a workshop by Korsmeyer and Edwards (2020) in

which they posited that designers assume they must 'fix' problems and people. Designers can take on this default role and consider the problem from a 'fixing' frame, but then they should also actively reframe the problem through other lenses. Some of the other proposed frames, such as 'Activism' and 'Agency and empowerment' were introduced as they seemed even more relevant to the 2020 context, considering the protests that had taken place over the summer.

After reframing and exploring the problem in different ways, students selected the questions they thought best responded to the needs they had heard articulated by the different interviewees. They combined these questions into a slide deck to share with the community partners.

Module 3 - From Defining to Brainstorming

In this two-week module, students were presented with several different techniques for brainstorming.

Ideation Session 1: Inn'eaux'vation Jam

The first brainstorming activity was the Inn'eaux'vation Jam. The name plays off the common practice in Southern Louisiana of replacing an 'oh' sound by 'eaux' in written language, as a marker of their regional heritage. In this practice, for example, 'Go Saints', the local American football team is The Saints, would be spelled 'Geaux Saints' on local flags and banners. This was a way of making the brainstorming activity seem more local. In this activity, students took their selected question and explored brainstorming about this activity as different types of solutions e.g., as a behaviour, a product, a technology, a service, a policy, or something else. The default solution space for students is often an 'app', and therefore the aim of this activity was to encourage them to consider the solution in different modalities.

Ideation Session 2: "Adapting the Wheel but not Re-inventing the Wheel"

For the second brainstorming activity, students were encouraged to seek precedents from other contexts "adapting the wheel but not re-inventing the wheel". The professor found some existing precedents and then prompted the students to find others and to discuss what these solutions could look like in New Orleans.

Students then proposed incremental solutions that built on existing solutions but were modified for the local context.

Ideation Session 3: Smash - When Two Ideas Collide

"Smash" was the third brainstorming activity. Students were partnered with another student, and they had to combine ideas. Each original idea had to be evident in their new idea. This was derived from creative challenges for students that the author had created over many years. The unexpected combination of ideas has often changed encouraged students to examine the solutions they were considering through different lenses.

Ideation Session 4: What Would Curitiba Do?

In this activity, students got an introduction to innovative design solutions to their selected areas of focus that had been implemented in several non-North American cities around the world. The aim was to broaden both their understanding of the issue and their view of the

solution space. They had to explore city-level innovations in cities in the Global South such as Curitiba, Bogota, Kampala, and Nairobi in particular, and examine how people tackle the same issues. These cities were suggested since they are sites of innovation outside of the Global North. Curitiba has developed many innovative social programs such as exchanging recyclables for food, a program that has been in existence since 1991 (Connect, n.d.). Bogotá has been recognized for Excellence in Social Innovation by the Inter-American Development Bank (Wade, 2018). Uganda has been ranked as the most entrepreneurial country in the world, even though most business ventures in that country remain informal (Patton, 2016). Mobile money transfer systems, like M-Pesa, were created in Kenya around 2002, pre-dating US mobile money transfer systems like Venmo, which was created in 2009, by many years (Piper, 2020). The reality of a city like New Orleans is at times closer to the reality of life in these cities in the Global South with similar populations, culture, food, and living conditions. Therefore, it was important for students to explore many different precedents in both the Global North and the Global South as they did their research, and to recognize that examples of successful responses to the same issues can come from the Global South.

Ideation Session 5: Only in NOLA

For this activity, students explored the problem space while considering the specific location, culture, climate, and infrastructure of New Orleans. This meant the students had to consider the 'character' and reputation of the city. They also had to ask both the local students and the community participants about the interests of residents. This led the students to consider solutions around food, music, dance, hospitality and sharing, since these are related to the culture of New Orleans. Some of the proposed solutions at this stage included festivals, food trucks, community refrigerators and recipe sharing platforms. These solutions were only considered when students focused on creating solutions for the culture and context of New Orleans.

Ideation Session 6: Here's to the Future

For this future-focused activity, students considered three systemic issues related to good health and wellbeing. They created positive future headlines about how their innovations had impacted these issues, as well as negative future headlines anticipating that their innovations had caused many unintended consequences (Figure 6).

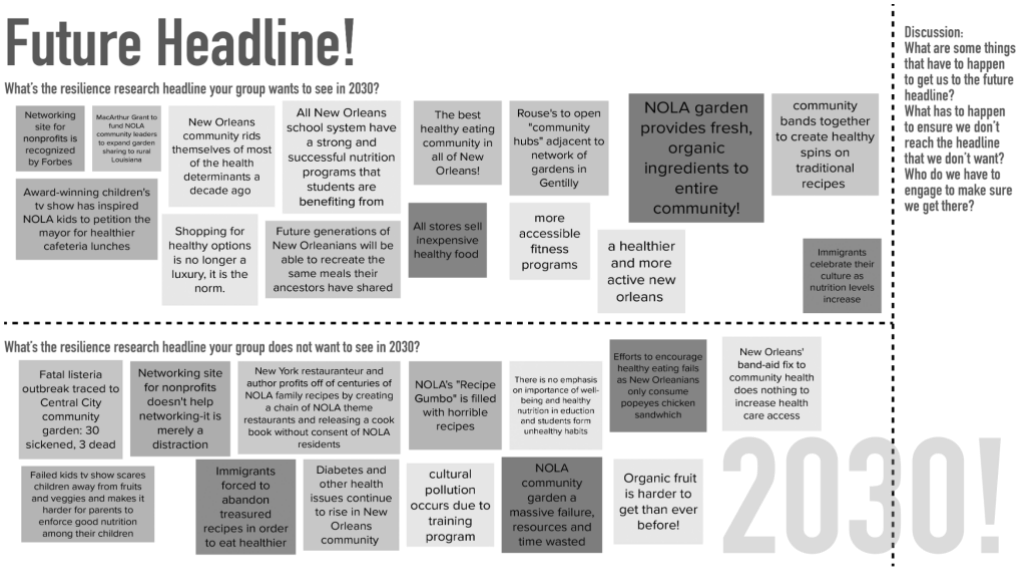

Figure 6. The Future headlines worksheet helped students consider potential good and bad impact of their design proposals.

Ideation Session 7: Mapping the Solutions

In this final activity, students collectively mapped their ideas to see how they were achieving collective impact despite the individual projects that they were each proposing.

At the end of this module, students had their mid-point presentations where they presented three concepts to a diverse audience that included Ms. C. one of the interviewees, visiting design professors from other North American universities, including two professors from the Caribbean, one from Puerto Rico, and one from Barbados, both of whom provided a lot of feedback given the similarity between New Orleans and the Caribbean

Module 4 - Prototyping and Testing

In Module 4, the students created two prototypes to share with audiences of people that they knew and people that they did not know.

The first prototype was a slide presentation which they shared with their colleagues on the whiteboard. Their colleagues had to offer both positive and negative feedback that would be generative and lead to the expansion of the initial idea. The “yes and” comedy and acting improvisation technique where actors build on the information provided by fellow actors (Bradford, 2020). They uncovered unanticipated issues through their colleagues’ negative feedback which was solicited through “yes, but” comments. They used the “What if” question to invite their colleagues to also be creative and generative (Liedtka et al., 2014), even though sometimes this led to negative feedback, and finally the “but why not” question encouraged the person giving the feedback to join the co-design process (Figure 7).

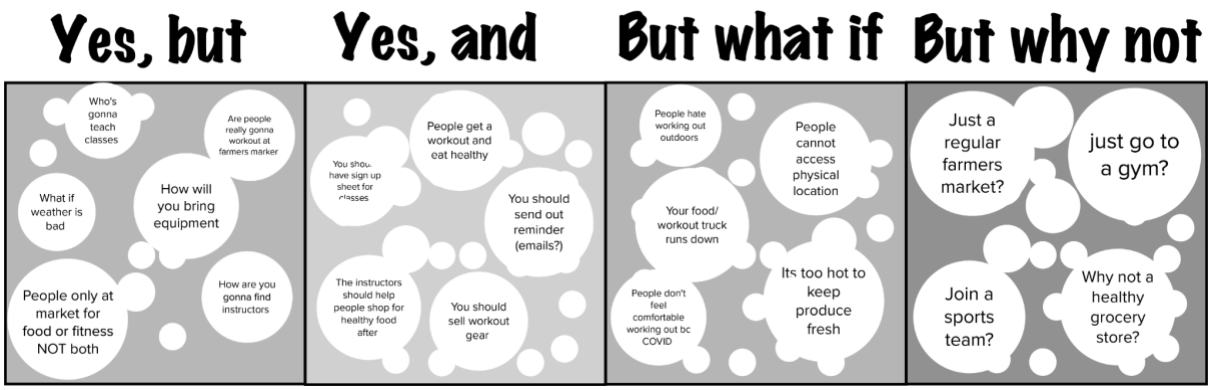

Figure 7. Students used the "Yes but, Yes and, But what if, and But why not" grid to help solicit critical feedback from colleagues that would lead to the generation of additional ideas.

The second prototype was a website landing page that described the way the proposed solution or service worked. The website was created quickly using a site with templates such as wix.com. The aim was not to create a perfect prototype, but rather to create a solution that would appear real so that they could begin to collect feedback (Knapp et al., 2016). Since they were going to solicit feedback from many diverse audiences a website would be an easy prototype that could be shared digitally.

First, they shared this prototype with people that they knew for feedback. This could include friends, family, colleagues etc., anyone from whom they thought they could elicit productive feedback. After responding to that feedback, the students were encouraged to bravely elicit feedback from residents of New Orleans via social media groups.

Module 5

In Module 5 the students presented their final design concepts via video conferencing. In the audience were Ms. C, one of the interviewees Ms. A, several other residents from New Orleans, and designers from New Orleans, from other cities and states around the United States, such as New York. The two design professors from the Caribbean also returned for the presentations.

Module 6

The semester ended with a reflectivity activity where students reflected on ‘design thinking’ i.e., a human-centred innovation process (Kimbell, 2019) and the ways that designers think. They examined popular models of design thinking. They also reflected on the process that they used to develop a design solution. They were asked to reflect on the models that they had seen, the process that they had used, and their own knowledge and life experience and identify what they each felt was missing from the existing design thinking models in a social innovation context. After discussion and reflection, they each wrote an article and drew their own model (Figure 8). The articles were shared via social media on a blog post with all fourteen articles.

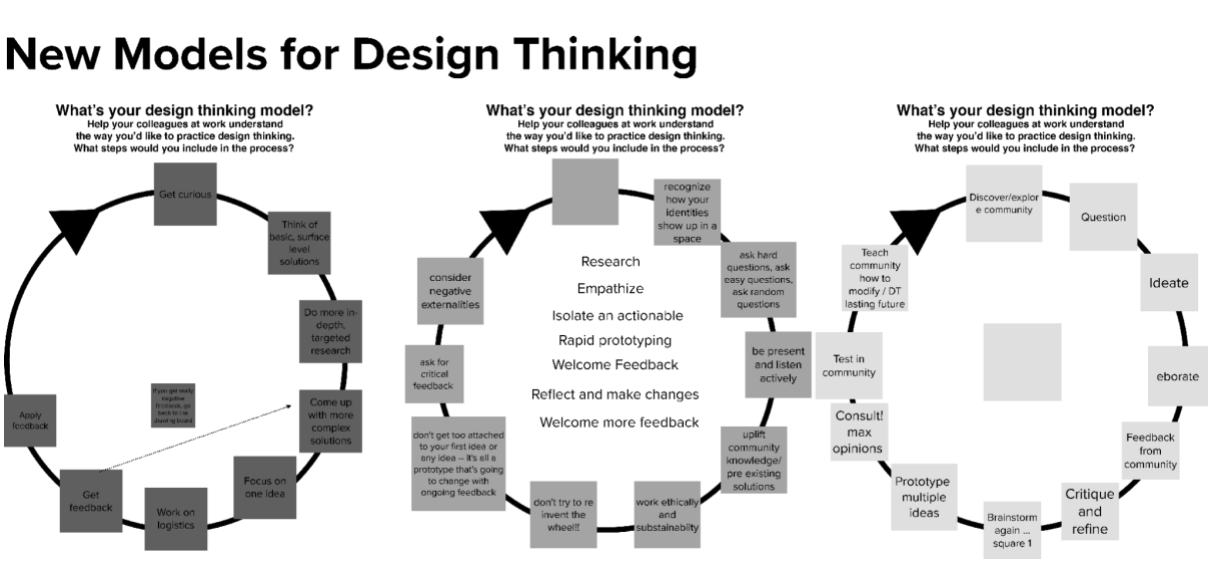

Figure 8. Students experimented with their own models for design thinking.

Discussion / Reflection

The COVID-19 pandemic created a pause and re-design. In this section, the key changes and their impact and effectiveness will be outlined and examined.

Course Delivery and Studio Experience

Though Tulane University had returned to in-person instruction by Fall 2020, this class remained remote. The all-remote delivery made it easy to have guest participants from around the city, the country, and even the world. The online whiteboarding platforms and shared presentations and documents made remote collaboration. Students were happier that the remote collaboration produced less waste than traditional in-person paper-based workshops.

Despite the remote delivery, the class was able to maintain some of the signature pedagogies of the design studio (Crowther, 2013), such as quasi-action research, problem-based learning strategies, experimentation, collaboration, and critique. Some signature design pedagogies were less visible in this course, such as there was more peer feedback and dialog between students and there was less dialog between the professor and individual student, as might occur in a desk crit. The professor created each class as a short, peppy workshop to ensure high levels of student engagement throughout the semester. The professor in the online version of the class assumed an entertainer-facilitator-type role to ensure high levels of student engagement, and to ensure the students did not remain as passive learners in the Zoom environment. This facilitator role required significant additional effort and planning by the professor than in the in-person version of the class.

Relationality

Significant effort was made to build empathy and relationships among the students despite the remote delivery of the course. Assigned students led an empathy-building warm-up activity at the start of each class. These activities were meant to help students get to know each other better despite the distance created from being a remote activity. Students worked in groups throughout the semester, conducting research and interviews together, even though they produced individual outcomes. The social nature of the design studio where students presented

their work to peers often was also maintained (Crowther, 2013) by including frequent 'share-out' activities in the class structure.

Content

The content of the class was situated in the crisis that was experienced by everyone, creating space for meaningful discussion and reflection among both students and participants.

At times there was a tension between the pedagogical aims of the class and the emancipatory aims of the class. An emancipatory agenda would seek more explicitly to empower the research participants (Reid et al., 2006), however in creating this version of the class it became clearer that the key stakeholders and beneficiaries were the students, and not the residents of New Orleans, even though the residents of New Orleans are involved in the creations and delivery of the class content. The course meets a Freirean goal of facilitating the development of critical consciousness (Shor, 1992).

Community Engagement

The in-person version of the class was created with an emancipatory focus. Ms. C's invitation prompted reflection on whether the emancipatory aim was being achieved originally. The invitation led to an acknowledgment that though the class aimed to be emancipatory, it could not authentically be such due to the 'outsider' statuses of both the students and the professor, and the distance from the New Orleans community. The research collaboration with Ms. C and Ms. H. made the class align more closely with its emancipatory aims.

The redesigned delivery of the course included many more interaction points with members of the New Orleans community than previous versions of the course. While remote delivery came with its own complications, it also made it easier to engage participants wherever they were located, such as in their homes but in a less intrusive way than a home visit. The remote access to participants also led to challenges, however, such as one interview took place while the participant was running their daily errands in their car, and the call dropped due to lack of internet connectivity.

The redesigned course attempted to include at least one touchpoint with non-university participants within each module. The touchpoint person was not the same within each module. They included Ms. C; Ms. H; a guest professor from another city, but who had lived in New Orleans; three residents who were interviewed; residents and non-residents, who were recruited via social media forums, and through the students' network of contacts, to give feedback on design ideas; and residents and designers who participated in the midpoint and final presentation. Though the class was remote, the students in this group were exposed to a more diverse range of external participants than previous versions of the class. In a future iteration, greater attempts could be made to engage community members in more in-class activities such as giving feedback on the problem statements and brainstorming activities. The active participation of community participants created a dilemma around remuneration for participation. Ms. C was compensated for her involvement in the class, since she was very present in several sessions, however, the budget that was typically allocated for the class could not cover the honoraria for all of the community participants. The university also had strict policies regarding the use of other forms of remuneration such as gift cards for interviews.

Much of the community engagement happened through the goodwill of the community members.

Critical Reflection

The in-person version of the class had the aim of provoking critical reflection on the design process. Previously these reflections would take place in class, in a more casual and haphazard way. The reflections in this online version were woven throughout the entire semester with more planning. Many of the reflections were shared publicly yet anonymously on the whiteboard. The students were vulnerable and open in their reflections and shared their discomfort with the design process, their creative growth, and their frustrations about education during the pandemic. They also were able to share the experience with their colleagues as they read their reflections as well. The final reflection and their proposal of a new visual design thinking model encouraged the students to think more deeply about the process that they were engaged in. The virtual learning environment and the intentional way in which it was created encouraged deeper reflections about the design practice and more creative responses by the students.

Conclusion

The conversion from in-person to remote delivery of the SISE 3010 Design thinking for social impact created an opportunity to re-design the course for optimum participation of residents and students. It also created space for reflection on the aims of the class. Even though the implementation of the image below demonstrates a more optimal version of this course. This version includes more community involvement within Module 3, during the idea generation phase, and a post-semester de-brief with the community partners to plan the next steps. This did not take place with the Fall 2020 class.

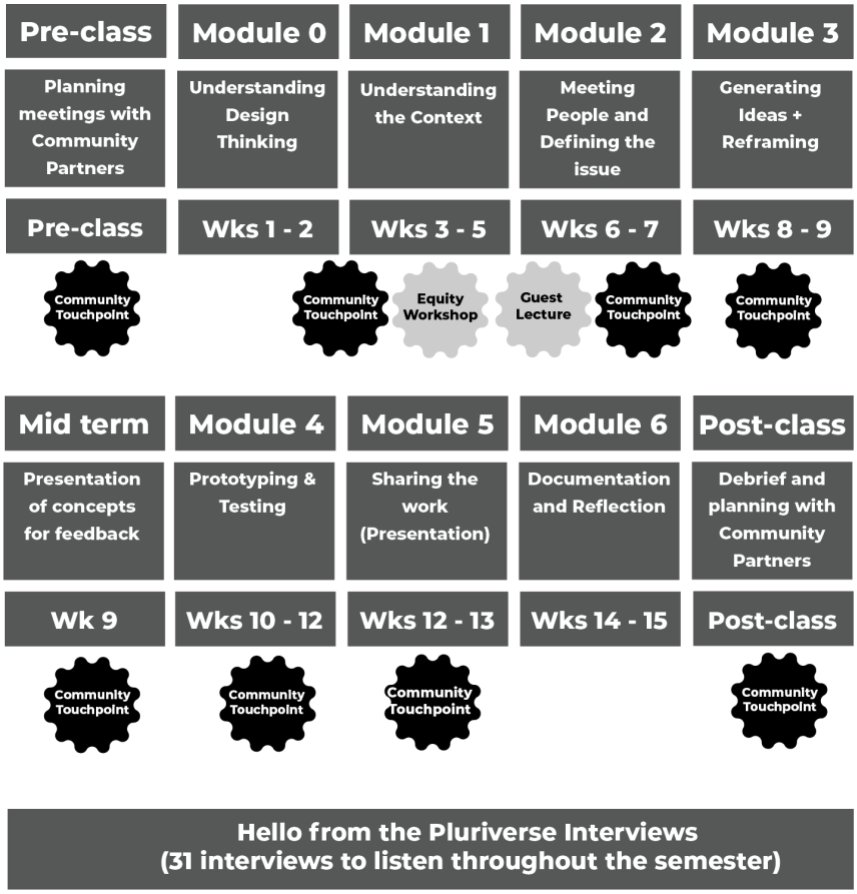

Figure 9. After reflection on the implementation of the course, this is the preferred structure.

The pandemic and the racial unrest in the United States forced a re-design of the Design Thinking for Collective Impact course at Tulane University. The instructor had to respond to the challenge of creating a pedagogical experience that was both situated in the challenging context of 2020 due to the pandemic, which added to students' anxiety and changed the delivery mode of instruction, and the racial unrest, which sparked greater awareness of social justice issues in the design studio. The demands of maintaining student and partner engagement in this new mode of delivery forced the instructor to create many new activities, and deliberately create reflection points in the design process. The new context forced a re-examination of the process of creating community among the students and building relationships with community partners. The resultant course demonstrated that despite the distance, it was possible to retain the values of relationality, community-centredness, and to create content that was situated in the lived and learned experiences of both the students and the community partners.

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Synchronicity in the Online Design Studio: A Study of Two Cases

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Abstract
Traditional design education models foreground place-based learning and teaching approaches that situate educators and students together in the studio. This experience enables an engaged and participatory teaching practice in which over-the-shoulder feedback and peer-to-peer critique become essential formal and informal learning interactions. However, the COVID-19 pandemic significantly interrupted the educational offerings of higher education institutions. Face to face learning ceased and rapidly pivoted to online and new remote models of delivery. For students studying design at the University of Sydney, this disruption significantly impacted the design studio – a space traditionally understood as a physical learning environment *and* a mode of learning and teaching. This paper presents a case study of two approaches to teaching design studio online delivered in early 2020. The first approach adopted an asynchronous delivery model in which students engaged with online materials at a time of their choosing, with assessments designed as individual tasks. The second approach adopted a synchronous delivery model in which students participated online in real-time, and assessment tasks were predominantly small-group tasks. In sharing the experiences of both case studies, this paper considers the role of synchronicity in delivering design studio online across four themes: interaction, assessment, feedback and design learning. Finally, the paper presents practice-based lessons that could inform pedagogical practices in design and support future models of design education.

Keywords
design studio, design education, remote learning, online, synchronicity

Introduction
The term studio can refer to both a physical space of teaching and learning in design and a conceptual or pedagogical design education model. As a place-based learning practice, the design studio offers an experience-oriented space for interactive exploration and experimentation, critical reflection and critique and creative collaboration (Marshalsey & Sclater, 2020; Shreeve, 2018; Costantino, 2018; Boling et al., 2016; Crowther, 2013).

Growth in online design education had been incremental. The adoption of internet-based applications in design education begun as early as the 1990s (Akar et al., 2012), and the University of Sydney was an early pioneer in this space. The Virtual Design Studio 95 project drew on approaches from computing to reimagine the virtual working space of designers, what Maher and Simoff (1999) call 'computer-mediated dynamic world models that create a sense of place', similar to the functionality of the physical design studio.

Beyond the discipline of design, online education in higher education experienced growth at a more significant pace, responding to drivers such as emerging technologies, access to the internet, and the digital economy workforce (Palvia et al., 2018). While many institutions have sought to offer online learning as supplementary rather than an alternative, others have been proactive in designing and delivering dedicated online learning opportunities (Sewart et al., 2020; Simonsen et al., 2019).

Recognising that 'today's designers are required to use technologies that continue to evolve' (Meyer and Norman, 2020:26), design education should continue to explore the space of online learning. Indeed, scholars had begun to explore models of remote design education (Jones et al., 2020; Lotz et al., 2019; Rodriguez et al., 2018; Lotz et al., 2015; Lloyd, 2013; Broadfoot & Bennett, 2003; Laiserin, 2002). However, this literature accounts predominantly for a period of careful planning and transition and not the overnight shift experienced due to the global pandemic.

The COVID-19 pandemic exponentially accelerated the shift to online education (Paudel, 2021). New socio-legal restrictions such as social distancing forced higher education institutions to pivot their pedagogical practices. Teaching moved from face to face to online, curricula were restructured, learning activities redesigned, and new models of interacting with students were established. The rapid pace of change required educators to quickly adapt to new teaching and learning paradigms, with little time to consider, plan, and prepare content for alternative delivery models. This shift was a learning experience in itself.

In addition to the social distancing measures, Australia also quickly implemented a travel ban restricting inward travel to citizens only. Caps on the number of returning citizens meant that a significant population of domestic and international students could not return to commence the new term. In addition, it quickly became clear that the first semester of 2020 would be delivered entirely online.

At the Sydney School of Architecture, Design and Planning, design is a core educational pillar alongside architecture and urban planning. Offering a program of undergraduate, postgraduate, and continued professional development opportunities, the discipline of design draws upon a strong history of interaction design. The discipline has expanded to teach design processes and methods, design programming, visual communication, web design, design theory and culture, and user experience design in recent years.

The academic year began in the last week of February 2020, during the early stages of the global pandemic. In week four, the international borders closed, and students based in Australia were required to isolate themselves at home. This marked the start of the emergency shift to remote teaching, and educators were asked to transition units quickly into an online mode. Decisions regarding teaching approach, methods and assessments were made and implemented quickly, and the semester was delayed by one week to provide educators with the opportunity to create alternative teaching and learning materials for students.

The traditional studio-based teaching model, a participatory and experience-based approach that combined over-the-shoulder feedback, peer-to-peer critique, and a significant proportion

of collaborative group-based learning, was significantly disrupted. In response, new models of synchronicity in online design education were adopted and applied across design units. In synchronous learning, interaction happens collectively in real-time, while in asynchronous learning, the interactions happen at different times and in other places (Singh and Thurman, 2019).

This paper considers the importance of synchronicity in delivering design education online, examined through case studies of two design units that adopted different approaches. The first case study, DESN1006 Design Process and Methods, describes an asynchronous online delivery model in which students participated at different times and completed assessment tasks individually. The second case study, DECO2014 User Experience Design Studio, describes a synchronous online delivery model in which students participate in real-time and complete assessments in small groups.

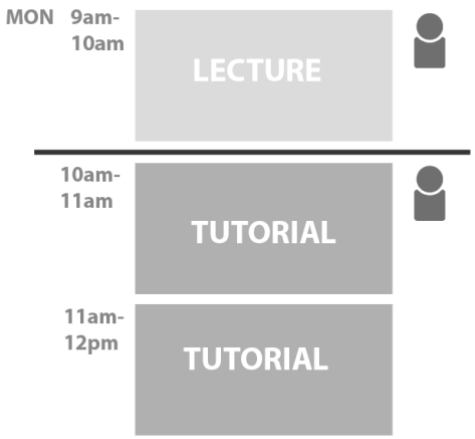
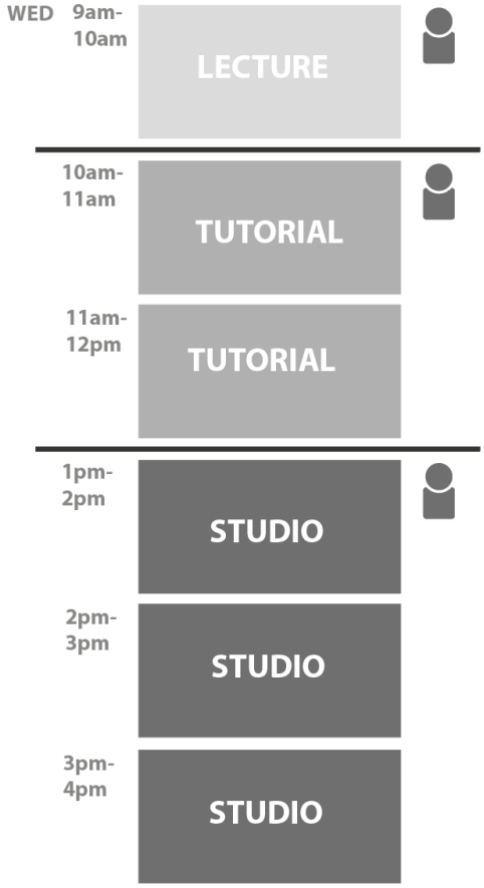
Context

The two units selected as case studies (DECO1006 and DECO2014) were chosen due to their similar structure and content: both are core undergraduate units in the Bachelor of Design Computing degree, both have the same unit coordinator, and course content addresses similar subject matters (design processes, design research, and user-centred design) Additionally, both units have a cohort size of between 180 and 230, comprising approximately 70% domestic and 30% international students. The most significant difference between the two units is that DECO1006 is for the first year, first semester students with three contact hours per week, while DECO2014 is for the second year, first semester students with six contact hours per week.

Prior to 2020, both units were taught using a studio-based approach. Students were first introduced to core theoretical concepts in a weekly face-to-face lecture. Tutors then led students through a face-to-face tutorial, engaging them in a series of design activities that explore that week's theoretical concepts in practice. In DECO2014, the tutorial was then followed by dedicated studio time for students to work on their own design project in small peer learning groups of 3-4 students, with the assistance of their tutor. Table one sets out a detailed breakdown of the pre-Covid teaching model adopted in both units.

Table 1. Pre-pandemic teaching models of DECO1006 and DECO2014

DECO1006 **Design Process and Methods**	**DECO2014** **User Experience Design Studio**
Description This unit provides an overview of human-centred approaches to the design of interactive technologies and environments. Students develop an understanding of design thinking and consider how it can be	**Description** This unit introduces students to principles and methods relevant to the user experience design of digital products and services. Students will develop an understanding of the concept of 'user experience' and how it extends to other design practices, such as

productively applied to different design situations. The unit covers theoretical concepts, methods and tools used in human-centred design, including user research, ideation, prototyping and user evaluation.	user interface design and interaction design. The unit covers methods for designing the user experience in a range of different contexts, such as mobile devices, wearables, and interactive environments.
Pre-COVID Teaching Structure	**Pre-COVID Teaching Structure**
	

Method

This paper adopts a case study approach to present and discuss two models of delivery. Case studies are an effective method in educational research, with the ability to describe rich contexts and provide educators with 'a range of experiences that can enable them to become prepared and knowledgeable to manage different situations' (Peimani and Kamalipour, 2021: 4). Comparing case studies can be an appropriate method for understanding if, how and why particular experiences differ and can produce early, exploratory knowledge (Goodrick, 2020). In this instance, this method enabled the authors to consider two models of teaching delivery in detail and draw out emerging insights for discussion.

Data was collected from Unit of Study Surveys (USS) for the two units. USS are institution-wide surveys that students complete for each enrolled unit, distributed online at the end of the semester. In 2020, 35% of students completed the USS for DECO2014, representing 53 completed surveys; and in DECO1006, 90 students completed the USS, representing a return rate of 49%. The USS asked students to respond to eight statements specific to their learning experience in this unit, with four related to the attainment of institutional graduate qualities (see appendix 1). Each statement was measured using a Likert scale, with students choosing from strongly agree, agree, neutral, disagree or strongly disagree. Students were also able to leave free-form comments for each survey question. Whilst the USS did provide a rich data set, it is centrally distributed. A limitation of this study was the inability of the researchers to adapt or personalise survey questions to gather insights related specifically to the delivery of the two models discussed. Data were analysed thematically, and the emerging themes are presented in the findings.

Case Study One: DECO1006 Design Process and Methods

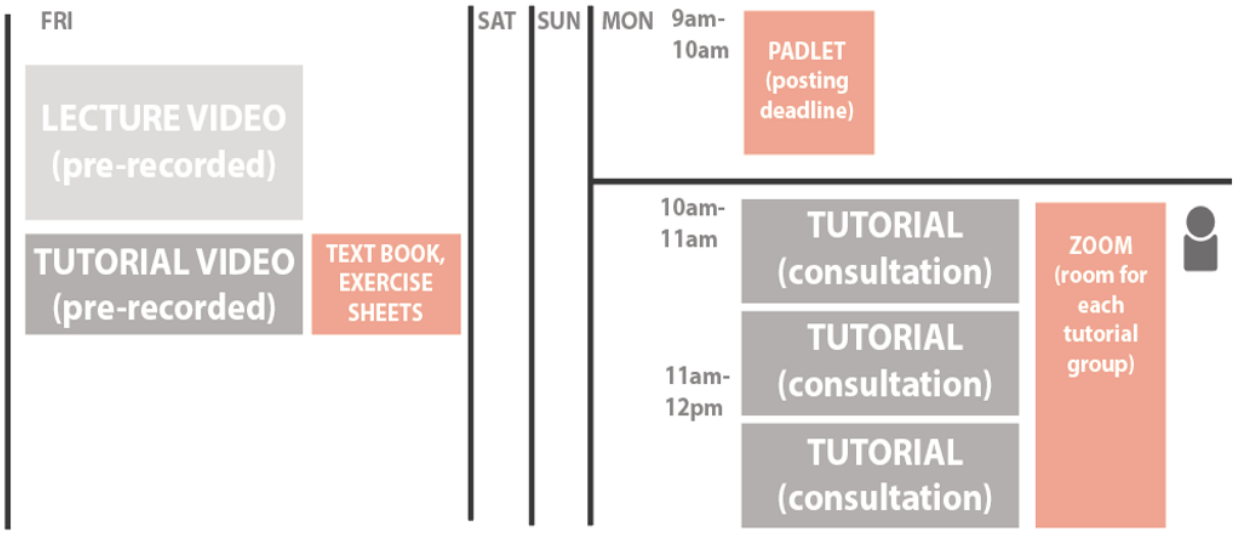
DECO1006 aims to provide students with an overview of human-centred approaches in design, exploring how these approaches might be productively applied in the design of interactive technologies and environments. The learning outcomes for this unit are: to engage in contextual inquiry to identify the need for a design; to show competence in design ideation; to communicate ideas and concepts visually; to apply knowledge of the psychology of user experience to designing interactive systems; to describe and explain activities associated with a design project, and to reflect upon and critique design activities using appropriate language.

The unit maintained the outline structure of pre-pandemic delivery: a lecture followed by a tutorial, but the elements delivered were restructured (see table 2). The lecture became a pre-recorded video, provided online via the institution's online learning management system Canvas, three days before the scheduled tutorial. The lecture was shortened to approximately 30-40 minutes, significantly reducing the traditional face-to-face length of one hour.

The tutorial was restructured from a two-hour face-to-face session to become a pre-recorded tutorial video, also uploaded to Canvas three days before the scheduled tutorial time. The tutorial video featured a talking head with the tutor providing introductions to each of the planned activities and working to scaffold the activity description provided in the textbook. Students were directed to complete tutorial activities individually in real-time, with in-built breaks in the video where students were asked to pause and complete a task. Finally, students were asked to upload the output to a shared Padlet online ahead of the scheduled tutorial time. Padlet is an online noticeboard on which students can easily upload images, view other submissions and provide comments and feedback to peers.

With students encouraged to complete tutorial tasks in advance, the timetabled tutorial was then used as an open consultation time with a live tutor. Students could use this consultation time to receive informal formative feedback on their Padlet submissions or their projects. The consultation model varied throughout the semester, comprising large-group consultations of approximately twenty students, smaller group consultations of eight to twelve students, and shorter individual consultation meetings.

Table 2. Remote teaching model of DECO1006 during the pandemic



The affordances offered by this instructional course textbook was a critical driver in proposing asynchronous delivery. The video introduced each task in detail and included a simulation of time to keep students on task and engaged. With the textbooks step-by-step instructions, students could work through the methods traditionally taught face to face independently, coming together for a synchronous consultation at a set time each week. Before the pandemic, unit assessments were significantly group-based, accounting for 70% of the overall grade and comprising a user-centred research report, a design proposal and a presentation. The remaining independent tasks were a reflective report (10%) and two (20%) quizzes. The restructured unit shifted all assessments to individual study and additionally repositioning the presentation as a video submission.

Furthermore, as a first-year first-semester unit, DECO1006 students have traditionally struggled with group work. These students have only just started at university and have yet to establish peer groups. In the restructured model, many students had not yet been on campus or met any peers face-to-face, and opportunities for engagement outside class was limited due to public health restrictions. Therefore, it was thought that an individual approach would be less stressful and perhaps more productive for students who would have insufficient existing social capital to work effectively in groups.

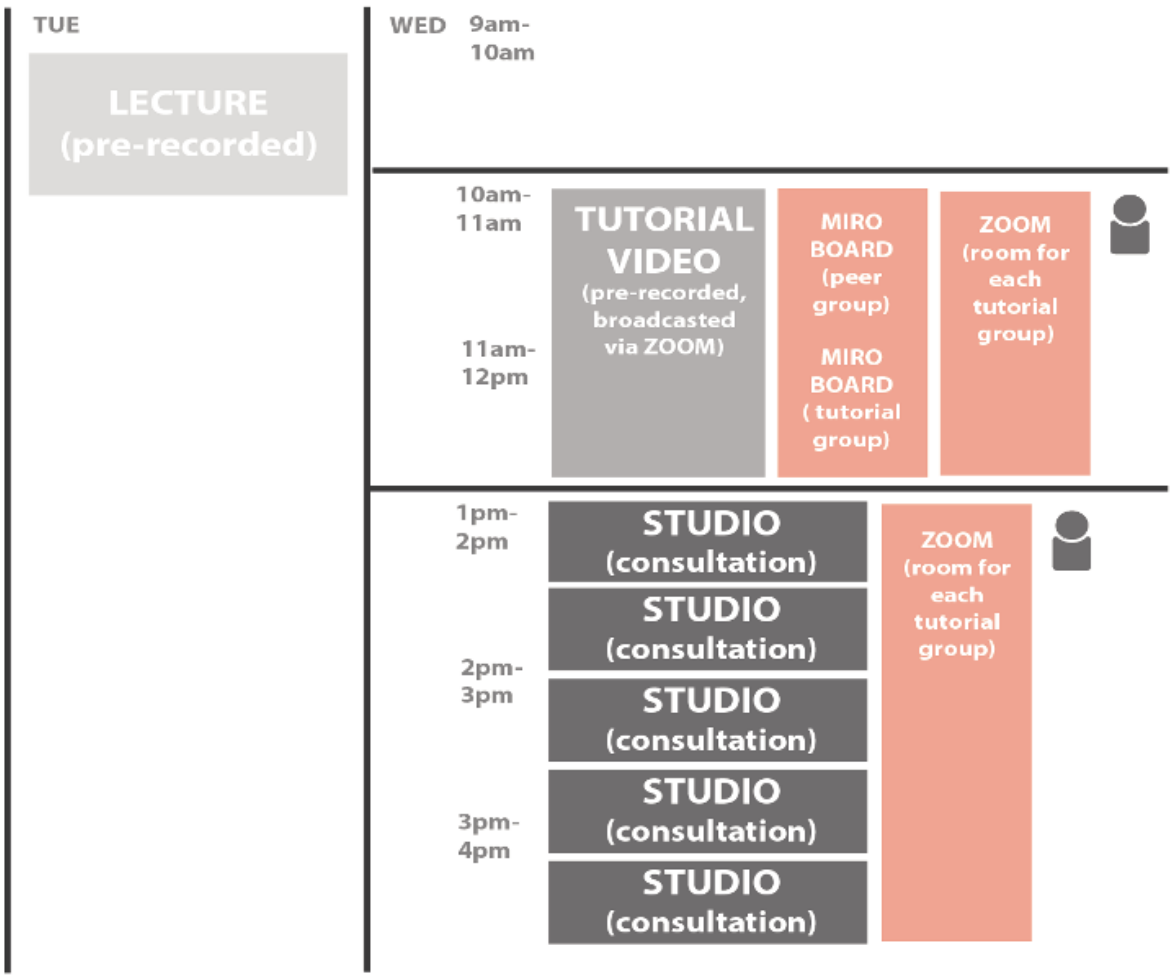
Case Study Two: DECO2014 User Experience Design Studio

DECO2014 aims to provide students with principles and methods relevant to the user experience design of digital products and services. Students develop an understanding of the concept of 'user experience' and how it extends to other design practices, such as user interface design and interaction design. The learning outcomes for this unit are: to apply research methods appropriate to the exploration of ill-defined problems; develop a clear design brief from exploration of an ambiguous problem area; apply principles of user experience design to a complex design project; develop and prototype advanced interactive digital experiences; document and communicate design concepts/processes professionally;

demonstrate an understanding of the concept of ‘user experience’; and work effectively and productively in teams.

The unit maintained the same outline structure as before the pandemic: lecture, tutorial and studio, but restructured the individual elements delivered (see table 3). The lecture was pre-recorded and provided online via Canvas to view at an allocated time in their timetable. The course tutor was also online and monitored discussion and responded to any emerging questions posted in real-time. The synchronous delivery aimed to reinforce the importance of the lecture as a learning activity and encourage broader participation. Tutorial content was pre-recorded and developed into videos aligned to the intended lesson plan. Each video began with a talking-head introduction that set out the tutorial's aim and highlighted any resources required. The video then provided instructions to guide students through the planned activities.

Table 3. Remote teaching model of DECO2014 during the pandemic



Students joined the weekly tutorial online using Zoom. The course tutor broadcast the tutorial video synchronously to the class and could pause the video at set points to allow students to complete activities (figure 1). Students self-selected small peer project groups from their tutorial group cohort, and these groups formed the basis for online tutorial activities. Additionally, Miro boards were established to augment the learning experience. Three examples of Miro include a whole class Miro upon which the tutor could share resources and

review progress on tutorial activities; a peer group Miro board, created for students as they worked in their small project groups; and a digital pin-up Miro used for a real-time critique with design industry experts (figure 2).

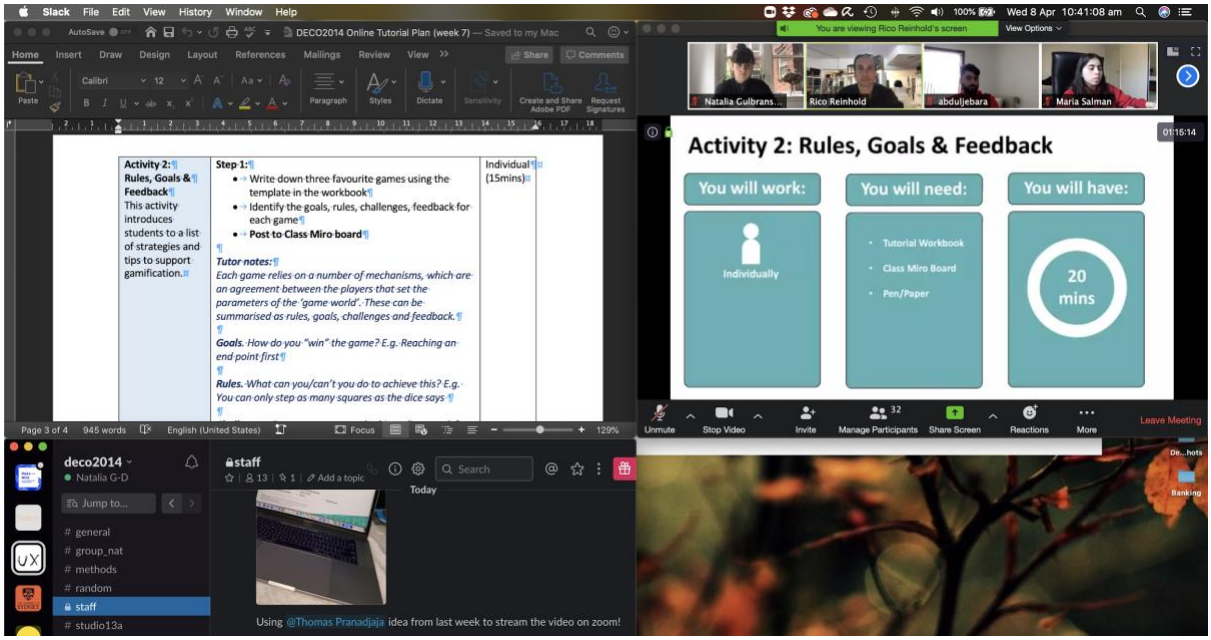


Figure 1. Online Tutor Perspective

Figure 2. Digital Pin-Up on Miro

Synchronous delivery of video content with a live tutor ensured that students had access to real-time feedback throughout the tutorial video, creating opportunities to ask questions and seek clarification during activities without disrupting the overall tutorial flow. In addition, the studio component of this unit was restructured to bookable consultation appointments. The

tutor entered a breakout room with small peer groups during the consultations and provided feedback or discussed project progress.

Face-to-face critique was recognised as a critical part of this studio unit, supporting students to develop deep design knowledge and understanding. This critique traditionally relied heavily on the relationship between tutor and student and between student and peers. Maintaining a synchronous approach was seen as an essential part of maintaining this practice. As a second-year cohort, DECO2014 students had already established peer groups, and it was imagined that they could build on their existing social capital and collaborate more effectively. Additionally, the unit had effective group work strategies as a key learning outcome, reflected in the 80% weighting of assessments. It was not possible to switch to an individual approach and still achieve the same learning outcomes – for this reason, the decision to remain a group-oriented unit was made.

Results and Discussion

Four themes emerged from an analysis of the data: interactions, assessments, feedback, and design learning. Each theme is presented and discussed, drawing on the reflections and observations of the authors as educators to explore the role and importance of synchronicity in both models of online design education.

Interactions

The first theme emerging related to the student-to-tutor and student-to-student interactions emerging in the synchronous and asynchronous delivery models. In considering student to tutor interactions, students were asked how well they felt supported to learn remotely.

The USS asked students to respond to the statement 'I have felt supported to learn in the online environment'. In DECO1006 (asynchronous delivery), just over half of students (52.2%) agreed with the statement (13.6% strongly agree/38.6% agree). However, 47.8% did not agree, with 23.9% selecting a neutral response and 23.9% disagreeing (12.5% disagree/11.4% strongly disagree). However, the free-form comments suggest a more nuanced experience. While students did comment on the support of individual tutors in DECO1006 (asynchronous delivery), there was a demand for more interaction. Respondents commented that whilst the tutorials should offer an opportunity for engagement, the time was instead heavily scheduled into consultation appointments and was perceived as limiting: "the ten-minute 'one-on-one' consultation was not enough engagement". In addition, the consultations were seen as a fragmented experience, what one respondent described as "… the feeling of stop-start communication when a tutorial begins and ends", with little time to consider tutor responses and ask follow-up questions.

The majority of students in DECO1014 (synchronous delivery) responded favourably (62.3%), constituting 37.7% strongly agree and 24.5% agree. A further 20.8% selected a neutral position, and the remaining chose to disagree (7.5%) or strongly disagree (9.4%). The utilisation of tutorial time also emerged comments from DECO2014 (synchronous delivery), where one respondent commented, "… it is always frustrating waiting for attention when you need help comments". However, overall comments from respondents were more positive. They

suggested that the interactions afforded by the experience were more akin to the face-to-face environment, allowing "students to bond as well as the tutors".

While this appears to suggest that respondents in both synchronous and asynchronous models felt supported by tutors, a significant proportion also felt otherwise. Considering student to student, or peer interactions, respondents were asked about their engagement with the wider unit cohort. When asked to respond to the statement 'I felt part of a learning community', less than half of students (45.5%) in DECO1006 (asynchronous delivery) responded positively (8% strongly agree/37.5% agree). The remaining respondents comprised a neutral position (33%) and a negative (21.6%) position (12.5% disagree/9.1% strongly disagree). In DECO1006 (asynchronous delivery), a significant proportion of comments related to the lack of opportunities for peer interaction and a desire for whole class and small group interaction. Respondents suggested that the unit might be improved by introducing group learning interactions, such as discussions. There was also demand "interpersonal" interactions: "it would be beneficial to have more contact with classmates in a more common, informal manner".

In DECO2014 (synchronous delivery), the results were similar defined, with slightly more students agreeing (52.9%), fewer providing a neutral response (28.3%), and slightly less disagreeing (18.9%). This suggests that the interactions afforded in both units did not enable a significant proportion of respondents to feel engaged with the cohort. One respondent did suggest that they felt "disconnected from the group", and another remarked on the challenges faced: "It is certainly much harder to collaborate and have a sense of ambition, community and accountability without a face-to-face aspect". However, the remainder of the responses were positive. Respondents suggested that group work played an important role in contributing to social connection: "Working in groups makes the online experience slightly more bearable because it has been rather lonely with the current situation"; and in supporting the learning ambition: "I enjoyed how the tasks involved group work". Overall, the interactions offered in the synchronous design studio can be seen to support the development of a positive, relational learning experience, improving interactions between student and tutor as well as between students and their peers.

Assessments

This theme related to the expectations around assessment and the ability of each model of delivery to support students through either group or individual study.

The USS asked respondents the extent to which they agreed with the statement 'The assessment tasks challenged me to learn'. In DECO1006 (asynchronous delivery), the percentage of students who agreed with the statement was high at 78.4% (35.2% strongly agree/43.2 agree). A further 14.8% remained neutral, and 6.8% did not agree with the statement (4.5% disagree/2.3% strongly disagree). Despite this, the free-form comments relating to assessments were predominantly negative. Students suggested that the asynchronous model negatively impacted their ability to complete assessments successfully "I really don't feel support supported for my assignment tasks". Respondents described a need for more "clarity" and "detail" around assessment expectations (including sharing of past assessment examples); more time required to provide guidance and instruction around

assignments “sometimes I was a little bit lost”; and a suggestion that the unit could be improved by including a group assignment.

In DECO2014 (synchronous delivery), just over three-quarters of respondents (75.4%) answering favourably (39.5 strongly agree/35.8% agree). A further 17% took a neutral stance, and the remaining 7.6% did not agree. The qualitative comments suggested that coordinating group work across assignments was challenging for students: “group tasks were difficult to complete due to availability of group members,” and for some resulted in additional workload: “group tasks became more like individual tasks than I would have liked them to be”.

Feedback

Another emerging theme was the feedback affordances offered by the synchronous and asynchronous models of delivery. Students were asked the extent to which they agreed with the statement ‘I have been guided by helpful feedback on my learning’.

In DECO1006 (asynchronous delivery), 68.2% of respondents agreed with the statement (21.6% strongly agree/46.4% agree), 20% adopted a neutral stance, and the remaining disagreed (8%) or strongly disagreed (3.4%). However, in the comments, respondents suggested that there was “not enough time with the tutor for feedback”, the timing of feedback was often out of sync with assessment timelines, and that increased time with a tutor would be beneficial: “more than one consultation with tutors per week is necessary”.

In DECO 2014 (synchronous delivery), the majority of respondents (78.8%) suggested that they strongly agreed (44.2%) or agreed (34.6%). The remaining students selected a neural response (7.7%), disagreed (3.8%), or strongly disagreed (9.6%). In the comments, respondents suggested that the studio consultations created opportunities for informal and formal feedback: “The studio sessions are really great as they allow me to ask all my questions to the tutors at rapid-fire and I get really detailed and comprehensive answers as well as more than the answer and genuine extra help”. Another respondent also highlighted the role that feedback can have on wider engagement in the unit, suggesting that limited feedback “greatly decreases motivation”.

Design Learning

The ability to recreate a valuable design education learning experience online also emerged as a theme. Students were asked to respond to the statement ‘I developed the ability to practically apply knowledge of the field(s) I am studying’.

A significant proportion of students in DECO1006 (asynchronous delivery) responded favourably, with 18.2% selecting strongly agree and 56.8% selecting agree. The remaining 25% comprised 19.3% neutral and 5.7% disagree. In the comments, respondents suggested that the unit delivered an introduction to design tools in an understandable way: “…the course has been highly instrumental in providing the foundations to good design practice”. The course textbook was similarly described as an “extremely helpful” resource to support asynchronous learning. Together with the instructional videos, respondents commented on the value of reviewing and revising the content at any time and the level of comfort and motivation this afforded.

However, more broadly, students felt that the asynchronous teaching and learning had a significantly detrimental impact on creativity, suggesting that it was “difficult to stay motivated, thus potentially leading to more rushed creative processes”, and that working individually was not as effective: “doing things like ideation individually feels like I am limiting the scope of my project from a creative standpoint”. The release time of tutorial content appeared to be a significant driver of how well students responded to content. Some suggested poor scheduling of asynchronous material had the opposite effect than intended. Rather than creating more flexibility, autonomy and choice for students, it appeared to create more pressure: “I think it would be better if the tasks were announced the previous Monday, so each student can choose how they want to manage their time - rather than having to squeeze in work in time we don’t have!”.

For DESN2014 (synchronous delivery), 81.2% of students agreed or strongly agreed with the statement, and only 5.7% disagreed. This suggests that despite the disruption of Covid-19, students felt that the model of design education delivered in DECO2014 still enabled them to practice the design skills developed. However, respondents remarked that whilst the tutorial videos were clear and easy to follow, they did not fully replicate the practice-based experience: “I feel like I get up every Wednesday just to stare at everyone and look at the guided video”. Similarly, many students commented on the extended time required to master the design skills in an online environment, suggesting that tutorials felt rushed and “hard to keep up within the two hours”.

Conclusion and Reflections

This paper has presented two case studies sharing synchronous and asynchronous models of the online design studio, designed and delivered in response to the 2020 global pandemic. The first approach adopted an asynchronous delivery model whereby students engaged with online materials at a time of their choosing, and assessments designed as individual tasks. The second approach adopted a synchronous delivery model whereby students participated online in real-time, and assessments were designed as small-group tasks.

Based on the insights uncovered and the reflective experiences of the authors as design educators, this paper concludes by suggesting that synchronicity has a significant role to play in delivering an educational experience that reflects the values of the traditional face-to-face studio. Whilst the asynchronous model appeared to deliver against the intended learning outcomes, the student experience suggests that the synchronous model offers a more authentic learning approach, particularly across areas of interaction, assessment, and feedback.

Finally, several practice-based reflections emerged. These reflections will inform future models of online design studio at The University of Sydney and may be useful for design education practitioners in other contexts:

Asynchronous Design Studio (DESN1006 Model)

- Tutor Interactions: To avoid a fragmented experience, look to schedule a variation of real-time tutor-to-student consultation approaches (formal and informal) that enable

incremental or staged engagement and create opportunities for quick questions and deeper, individualised contact.

- Peer Interactions: Create informal learning opportunities (e.g. discussion groups) in which students can develop a social connection with peers and review learning materials. This could take place during tutorial sessions, working to build confidence, community, and accountability, whilst also reinforcing the intended learning outcomes.
- Assessments: Ensure assessments are scaffolded with a strong narrative that clearly details out the intended outcomes, outputs and manages student expectations. Good practice would be to include past assignment submission with a grading rationale as an exemplar.
- Feedback: In addition to consultations for general feedback and critique, establish a set schedule of dedicated feedback consultations for students to receive feedback on upcoming assignment submissions.
- Design Learning: Seek to begin each asynchronous learning experience with a short exercise that encourages creativity and rearticulates the underpinning drivers of design studio. This could also be a pre-tutorial peer-based activity to extend creative thinking and encourage collaboration.

Synchronous Design Studio (DECO2014 model)

- Tutor interactions: Utilise tutorial time to include opportunities for tutor-student interaction at the start and end of the tutorial. This is particularly important at the start of the unit to enable students to build a rapport with the tutor.
- Peer interactions: Establish strategic peer learning groups at the beginning of semester to develop a collative awareness of unit expectations, intended outcomes, and group accountability, whilst also contributing to sense of community in the unit cohort.
- Assessments: Maintain group assignments where possible to maximise opportunities for sustained engagement and extended creative learning opportunities. Utilise the strong peer learning groups established to ensure effective collaborative effort.
- Feedback: Offer a model of regular consultation that comprises formal and informal feedback and critique, with dedicated opportunities for peer feedback in small group consultations.
- Design Learning: Carefully plan tutorial time to include activities that develop knowledge and understanding but also enable practice-based reflection. Lesson plans may account for less activities than would normally be delivered in a face-to-face tutorial but allow for increased instruction and clarification.

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Turbulence in Crit Assessment: from the Design Workshop to Online Learning

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Abstract
Critique in design education is redefining itself, but its primary aim still focuses on offering and receiving feedback on workshop projects. The global pandemic has forced teachers to adapt their methods for online workshops. The following paper questions how design critique has changed teaching and learning experiences, focusing on the distinctions between in-person and online sessions. Before winter 2020, students used to wander through the school's workshops, filled with sketches and models of ongoing projects. Since then, we were faced with the loss of a shared physical space leading to many changes that should be addressed as online workshops are going forward. As a result, the pandemic has accentuated some of the challenges of offering detailed feedback to projects and has shown the complexity to stimulate students' interactions during a critique. Gaps created through social distancing seem to have impacted not only the critique activity but the entire project and learning process. By exploring the teaching experiences of a dozen workshop tutors, this paper brings out concerns about the metamorphosis of general interactions and highlights an impact on the design activities. By referring to Lave and Wenger's situated learning, we discuss the importance of interactions while conducting projects by explaining, discussing, showing, or just looking at what others have done. This paper provides an overview of key elements to improve feedback and communication, emphasising that constant interactions with peers, teachers, and experts are especially meaningful to prepare the designer to its future community of practice.

Keywords:
design education, critique, social practice, online workshops, design process

Introduction
The design process is a complex synthesis of various activities accomplished by the designer in interaction with other actors. As it has been shown in past research, design projects alternate through cycles of various actions, including framing, naming, moving, reflecting, evaluating, and negotiating (Schön, 1983; Valkenburg & Dorst, 1998; Zahedi & Heaton, 2017). As listed, an emphasis is offered to the active or retroactive analysis of ideas and decisions during a project through various forms of individual or social evaluation. Similarly, Christensen and Ball (2016) state that "evaluative practices are important in all creative industries, where key individuals are invited to assess products 'in the making'" (p. 116).

In agreement with this statement, we feel it is crucial to offer training opportunities to design students to develop their critical thinking skills by receiving and offering feedback. Sustained training eventually brings the students to initiate their critique activities with themselves and in interaction with others (Tessier, 2021). According to Goldschmidt et al. (2010), architecture

students can participate in up to 250 to 350 critique sessions throughout a typical training of four to five years – underlining the critical relevance to discuss this activity. Still, some say that "we lack an in-depth understanding of critiquing in design education" (Oh et al., 2013, p. 303). Indeed, we noticed that a limited body of publications offers detailed accounts of this practice. Among these studies, some are acknowledged for their analytical quality and descriptive depth. For example, Schön's analysis of the one-to-one desk crit is often referred to as one of the most exhaustive reports of this designerly assessment practice. However, fewer studies have investigated the unfolding of critique activities when involving multiple social actors (some examples are: Oh et al., 2013; Gunday Gul & Afacan, 2018; Gray, 2019). Gray (2019) also states that even fewer researchers have addressed the critique as an informal activity, based on daily interactions and discussions with friends, peers, and others.

Faced with the global pandemic during the school year of 2020-2021, most teaching institutions had to react quickly when schools and universities were compelled to pursue their activities online. Due to lockdown protocols, design teachers and institutions have had no choice, but to adapt their face-to-face studio methods to online workshops (Jones, 2021). With this reflective paper, we propose to study the drastic change in studio approaches on design critiques. By analysing the reflections of 11 design studio teachers, we will explore five complementary aspects of their experiences: ease of interactions, student attitude, teacher experience, design project, and technology.

Through this reflective paper, we wish to create bridges between their experiences and retroactive reflections with our theoretical and practical comprehension of design studio learning. This paper aims to initiate a discussion around design critiques to inform potential improvements of studio practices. Based on our teaching experiences, we sense that these changes have induced unprecedented transformations in the traditional ways of critiquing ever since Ecole des Beaux-Arts. Gaps created through social distancing seem to have impacted not only design critique activities, but the whole project and learning process of design students. This discussion will lead us to refer to Lave and Wenger's concept of legitimate peripheral participation, drawing attention to the social nature of design practice and the importance of sustained formal and informal discussions to fully integrate a community of practice. But first, we wish to address a few of the main features of critique activities in the pedagogical context.

The Design Crit

The critique is a fundamental activity of the design process, allowing the designer to renew its perspective on the ongoing project. Design critiques occur in many forms (formative or summative) and involve various actors. In their literature review, Oh et al. (2013) propose a clear distribution of these parameters. From an individual setting to a public context, the critique can be organised solely between a teacher and a student (also called 'desk crit') as well as in small groups, as a class, or in front of a public assembly with a jury and other experts. According to Oh et al. (2013), comments can be expressed either verbally or by drawing, writing, or moving. The unfolding of design critiques is multidimensional according to the actors involved, the stage of the project, the chosen critique mode, etc.

Multiple pedagogical objectives are associated to design critiques. The first objective is also the most straightforward: to offer and receive feedback on an idea or project state – from the

preliminary proposition up to the final solution (Gunday Gul & Afacan, 2018; Gray, 2019). The second aim seeks to practice the learner's communication skills, from sharing an idea to building an argumentative speech. As advocated by Oak (2000), peer interactions are essential to learn design "through talking to others, and through hearing others talk, about design's successes and failures" (p. 88). The third objective of the design crit seeks to develop reflective and critical thinking skills by "encouraging the discursive exploration of design processes, decisions, and outcomes" (Gray, 2019, p. 930). A fourth purpose values the transmission occurring from the expert or peers to the learner (Gray, 2019). As critical discussions take place and gain in complexity, skills and knowledge transfer unfold while also contributing to the development of critical thinking. Finally, as stated by Schön (1985) and Goldschmidt et al. (2010), the critique's greatest ambition is to introduce learners to some of the fundamental principles of the discipline through a project. These interactions contribute significantly to shape the designer's thinking process and "to develop their own design values and preferences" (Christensen & Ball, 2016, p. 116).

By acknowledging the transformations that social distancing and online learning bring to design education, we question how the design critique has changed teaching and learning experiences. On that matter, Oh et al. (2013) wrote that "digital technology has radically changed the way studio teachers have conversations with students. In particular, critiquing modalities in digital design studios" (p. 312). Building on this affirmation, we organised an online questionnaire as reflection prompts and focusing on the distinctions between in-person and online critiques. The questionnaire was sent to all teaching workshop staff of the first and second years of the industrial and interior design programs offered at the Faculty of environmental design of University of Montreal (Canada). More precisely, we reached out to a total of 25 studio teachers and succeeded in collecting 11 complete questionnaires. All respondents were actively teaching in the online workshops at least once during the winter or autumn semesters of 2020 or the winter semester of 2021. All of these studio teachers (except 2) had previous experiences with in-person workshops, and, therefore, could easily compare both types of experiences.

A total of six reflective development questions (answers varying between 7 to 10 lines) were asked to the respondents:

- Please identify 3 advantages of conducting online design critiques.
- Please identify 3 disadvantages of conducting online design critiques.
- Do you feel that the critique activities carried out during online workshops require more preparation? Please explain why.
- What are the pedagogical impacts of online critique activities? Please explain why.
- Do you notice any changes in the social interactions between the teachers, with the students, or with the juries?
- Do you feel that the learning during these online review activities is equivalent to face-to-face critique activities? Please explain why.

Their answers are what we build on to propose the paths for reflections tackled in the next section.

The Challenges of Social Learning during Online Workshops

The analysis of the questionnaires allowed for the emergence of five different themes highlighting some of the challenges and benefits of online workshops. All elements discussed in the next categories emerged from the collected data. The themes are presented in a gradual sequence from the most to the least discussed in the questionnaires. The first category is related to the interactions occurring during the online critiques, mostly referring to the flow and ease of maintaining a live conversation online. The next two categories refer to the actors involved in day-to-day critiques: how teachers perceive students' involvement and what teachers notice regarding their tasks. The fourth category seeks to highlight the differences noted during the project unfolding. Finally, the last category is related to the use of technology to conduct critique sessions.

Interactions

Across all five categories, comments regarding online interactions stood out most from our analysis. The participating teachers all mentioned preoccupations about the lack of spontaneity in verbal expression, while some also added the challenges of communicating through drawing. Some did talk about the lack of informal exchanges to build links with the students, and the difficulty to entertain warm, diverse, and active conversations with them.

A recurring tendency was to note that there were fewer interactions with students and that these took more time. Limited access to body language, instant reactions, and on-the-spot questions do seem to add an important difficulty when proposing direct feedback to students, either in groups or alone. Teachers tend to use their interpretation of emotions and stress to modulate their comments and interactions.

Finally, a recurring reason that explains all of the noted challenges regarding interactions is the latency span of virtual communication software, which creates a fear of interrupting verbally or with surrounding noise (encouraging a majority of people to close their microphones). These technological limitations seem to break the flow of interactions and limit the exchanges with students during critiques. As a result, it is more difficult to confirm the comprehension of students and to get them to comment or discuss substantially.

Students

The second category regards students' attitudes during the critique. First of all, to build on the previous category, it is more difficult to keep students' motivation, interest, and attention during group critiques. Many respondents mentioned the challenge to get answers from the audience with long silent pauses, closed cameras, and the need to develop strategies to keep students active and involved. Some of these reactions are explained by screen fatigue due to accumulated hours of workshops or classes. A specific concern regarded the difficulty to ensure that all information and instructions were understood correctly by students.

Our respondents noticed a change in the significance that students attribute to these punctual events. In person, students attribute particular importance to mid- or end-of-project critiques as project milestones. For example, they use these opportunities to dress up and to prepare their speech, translating the significance they attribute to this event for sharing their work as best as they can. Still, online workshops seem to have diminished how students approach these

occasions. They seem to take criticism less seriously and are less trying to make a good impression. Moreover, pre-recorded presentation asks for less preparation on the part of the students.

The last observation about student behaviour is that they tend to share less with others. As they are more isolated, they have fewer occasions to exchange on their respective projects. Group dynamics are very difficult to create. Still, a benefit gained from online workshops is that students learn better how to work with distant teams, which is an essential skill for the work world.

Teachers

A few observations were made by teachers according to their daily teaching tasks. On the positive side, they noticed to be more physically comfortable while teaching, and that there was less preparation needed in terms of space organisation. Also, experts are more willing to participate to critiques since online participation is more convenient for professionals. Less positively, it was noted that coordinating between teachers was more demanding, that evaluations and feedback take more time, and that skills for animation and explanation are more solicited. Accordingly, demonstrations are much more difficult to entertain through a camera than in person.

Project

Regarding project processes and submissions, a lot of aspects were discussed as different from previous in-person workshops. While some stated that creativity was more limited, others invoked the difficulty to offer detailed feedback to projects. Online workshops make it more difficult to entertain a project process that is centred on materiality and mock-ups. Moreover, restricted visits on campus also limited interactions with technical workshop experts (metal, plastic, wood, etc.), which greatly contribute with their specialised knowledge to students' formation. Many other comments touched on the work submitted by students, being simplified, less original, and more generic. The difficulty to display projects for sharing with class colleagues suppresses a fundamental aspect of workshops, based on peer learning. More emphasis also seems to be offered to the quality of graphic presentations, instead of focusing on the industrial and interior design aspects of the projects. To conclude, the learning experience seems less active, more theoretical, and very different from in-person workshops.

Technology

The last category of comments identified in the answers to our inquiry touches on technology. Of course, all previous categories are concerned by technology, but some limitations are specifically technological, such as technical problems, unstable internet connection, and sound latency. Also, some restrictions are linked to the skills of a person to use technology (for example, being able to draw on the screen in real time). A last repercussion of social isolation is that most inspiration and research elements come from the Internet, while students are usually invited to visit spaces, interview potential users, observe behaviours, etc.

In summary, our investigation underlines the uncertainty and the lack of spontaneity that is associated with the change to online workshops. The loss of a shared common physical space has led to many important changes that should be addressed, as online workshops are going

forward. Moreover, it draws attention to the social nature of design (Bucciarelli, 1988) and the importance to interact with peers, teachers, and experts throughout projects by explaining, discussing, showing, or just looking at what others do. Some positive aspects of online learning have been mentioned (mainly regarding preparation and the development of teamwork skills), but preoccupations are mostly directed to the formality of interactions between the actors of the critique activity, leaving aside so many perceptual details of human exchanges. In order to underline the importance of sociality, observation, and engagement in design pedagogy, we wish to refer to Lave and Wenger's concept of legitimate peripheral participation.

The Loss of Informal Occasions for Critics

In their book on situated learning published in 1991, Lave and Wenger discussed how novices come to integrate into their future professional community (i.e. community of practice). A community of practice refers to a group of individuals sharing interests on the same subject, field, or domain. Their common interest allows them to "share experiences, ways of thinking about the work they do, and a network of connections that distinguish them from others" (Davies, 2016, p. 8). Lave and Wenger (1991) shared observations on how practitioners learn their skills by interacting and discussing with others as well as by participating and observing the daily activities of a community.

Fundamental aspects that attest to the integration of a community of practice are directed to the re-creation of practices, the acquisition of a shared vocabulary, and the co-creation of knowledge (Sawyer, 2012; Davies, 2016). Therefore, by observing the legitimate peripheral participation of individuals, we come to notice skill development in action through increased participation, autonomy, confidence, and accuracy of actions (Kvale, 2007). Lave and Wenger have argued that "social participation within the community is the key to informal learning" (Boud & Middleton, 2003, p. 194). While Lave and Wenger have studied the practice of diverse professionals, strong connections have been discussed with design training (Liem et al., 2017, Scherrer et al., 2017).

One important aim of design education is to introduce novices to the tools, the working processes, and the social environment of the discipline by progressively bringing students to be comfortable with the reality of their future community of practice. Critical interactions with peers, teachers, and experts are key for design education at every step of the learner's journey (Tessier, 2021). In that sense, the quality of the social space created between individuals occupies a key place for learning with and from others through informal exchanges and formal comments. Gray (2013) underlined the value of receiving critiques from varied sources (formal and informal). While formal critique is clearly positioned as part of the pedagogical design structure, "informal critique appears to be more emergent, mirroring the professional obligations to communicate and externally reflect with peers" (Gray, 2013, p. 703). In that sense, the creation of informal exchange spaces is crucial when planning online workshops, especially as students move through the stages of the design curriculum. Tessier (2021) has shown how the social structure of the workshop evolved from the first to last year of undergraduate design studies by first relying strongly on the teacher's advice, then developing stronger bonds with their peers, and, finally, getting in touch and connecting with experts from the field. These phases encountered by the students show the increasing complexity of their social relations, bringing them to enter their community of practice. Additionally, most of these

social relations are built through informal peer critiques, drawing special attention to that intricate aspect of online workshops.

Such a reflection about the foundations of design education makes us question the noted difficulty identified in regard to social interactions during online workshop critiques and the need to sustain the same quality and diversity of exchanges while using online platforms. Although some challenges to entertain social interactions during face-to-face workshops are normal (due to group dynamics, shyness, stress, etc.), they are nothing compared to the many efforts that are organised to entertain, sustain and generate interactions with students during formal and informal critiques. The studio teachers having completed our questionnaire mentioned many times the lack of spontaneity and absence of informal conversation with and between the students, which prevent the development of more personal and human relationships with the students. Moreover, as students were confined to their homes, informal meetings were exceptional and needed to be initiated by someone instead of happening randomly (no sharing lunch or coffee break, no bathroom conversation, and most of all, no workshop chatting). As mentioned by Jones (2021), “one thing the crisis did was make certain things visible” (p. 8). As some of these difficulties were already present with in-person workshops, they took exponential proportions in online learning environments.

Gray (2014) has shown how design workshops are built on a variety of formal and informal social interactions that contribute to the creation of the student’s repertoire. Still, in relation to online workshops specifically, we advise that particular efforts should be invested in creating convenient and spontaneous social spaces for learners to exchange between themselves or with teachers and experts. Receiving critique from more knowledgeable others is crucial but building relationships with peers and colleagues is what makes an undergraduate experience so unique. Moreover, the sense of confidence and respect can influence how students accept or interpret the comments they receive. As noted by Lave and Wenger, informal learning is key for the development of social disciplines. For example, some of our respondents noted positive repercussions when clusters of students are willing to leave their camera and microphone open while working. Such habits allow for informal conversations with workshop colleagues while developing a project and offering feedback. While they work on their project, students can learn more about each other on a personal basis, but also ask questions about technical aspects of their respective projects, share methods and offer or receive critics. This is strongly reminiscent of in-person workshops when students could share large tables and discuss while developing their respective projects.

This reflective paper on the shift to online learning and its impacts on design critiques has led us to think more globally about the sociality of design pedagogy. Critiques are a fundamental aspect of the designers’ education and contribute significantly to the lived experiences of design students. Their unfolding and organisation changed as online workshops were developed. Teachers tested new ways to motivate exchanges and stimulate discussions (i.e., pair up students in smaller groups, attribute facilitator roles, encourage written comments in the chat section, etc.). Still, further explorations should be directed at finding other ways of stimulating social interactions online. The collected data and present discussion have brought us to notice how much informal occasions to discuss and exchange have an active role in the

experiences of learners and teachers and how highly these occasions were affected by the shift through online workshops.

Conclusion

The past year has suddenly immersed us in a technological world that has completely transformed the way we interact with others. This significant change in communication intensifies certain aspects of teacher and student relations. According to our exploratory investigation, all teachers seem to agree that design critique is undergoing a major shift. While most of our respondents were wondering if the critique experience online is as complete as in person, we showed that virtual environments for teaching ask for adaptation and change in the teaching strategies and work methods. Uncertainty is sensed in the community, in part because previous experiences with online teaching are very limited. We feel that this consequential shift has led to an important reassessment of pedagogical design practices, which will hopefully inform in-person workshops in the future. In the end, informal interactions and learning from observation seem to be the most problematic aspects of online workshops. Efforts are needed to create strategies that enhance participation and create an environment conducive to share experiences and thoughts freely. As soon as this space exists, students will certainly be more likely to share their constructive comments during online reviews and informal occasions. For students, it means they will be more comfortable to give and understand feedback, and by extension, develop their critical judgement.

This reflective paper led us to consider the sociality of design training and the situatedness of its learning opportunities. Our questionnaire investigation also raised another concern that was outside the scope of this article and that could be researched further in future work. Combined with peer learning, workshop experiences also encourage learning by observation. As mentioned by Gray (2013), the “natural physical co-location of the studio environment” allows for informal learning, but what about when technology limits what can be seen and observed in action. This lack of proximity between students meant everyone in their own environment, preventing an important aspect of workshop peer learning. Although learning by observation is not directly related to design critiques, it does contribute to the informal social experience of the workshop by motivating students to get inspired by each other, share advice on their work methods, and spontaneously offer critical comments.

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26.4

From Sharing Screens to Sharing Spaces

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Abstract
The enforced move to remote teaching delivery over the last year has brought many challenges to studio-based courses and the traditional modes of delivery that are often associated with UK Art Schools. Central to these challenges has been the loss of the design studio as a focal point for engagement and learning within a community of practice. However, the conviction that design is a subject that can be taught not just learnt through communal experience has propelled alternative remote modes of engagement to be explored through this period of separation from our on-campus environments. This study details the use of the on-line application Miro as an analog to the traditional 'physical' design studio in facilitating remote delivery to studio based undergraduate design and craft students. Reflecting on the delivery of five projects between November 2020 and April 2021 the authors describe how Miro was used as a platform to structure teaching delivery, share creative content and as an environment to foster remote dialogue amongst students. Through an evaluation of each project's delivery within digital spaces the authors identify the emergence of new behaviours and new opportunities that can support students working in digital studios to move beyond sharing screens to sharing spaces.

Keywords
design pedagogy, remote learning, communities of practice, design Studio, sticky curriculum

Introduction
One of the key impacts of the COVID-19 pandemic across Higher Education, was an acceleration of the use of emergent technologies, particularly those that support distributed working, to support learning. Whilst the last 15 years has seen a radical shift in people's relationship with and access to technology, its impact on the day-to-day studio-based teaching taking place in art schools across the UK has been more modest. Whilst much has been written about the potential for such technologies to support learning (Orr, 2017; Deakin and Webb, 2016; Tovey, 2015), adoption within UK arts education has been slow and generally focussed on a blended approach rather than a completely digital approach. Indeed, prior to the COVID-19 pandemic, the authors had little engagement with, or understanding of, how digital technologies might be used to create a completely digital studio environment.

This study reflects on how an online collaborative platform (Miro) was used to create an ad-hoc digital studio environment in response to an inability to teach in person due to the COVID-19 pandemic. The Miro platform was chosen due to its widespread use within professional practice, providing an easily accessible collaborative whiteboard space for remote sharing of thoughts and ideas. Though it was not an institutionally supported software it afforded free

access and provided a simple, intuitive user interface. Specifically, the paper examines the rapid shift to on-line delivery within the context of a UK undergraduate Product Design programme and how this impacted the teaching of projects traditionally taught in a studio. This paper is our contribution to the ongoing effort to understand how Art & Design pedagogy might continue to develop in response to the COVID-19 pandemic. Our contributions are two-fold:

1) to recognize the behaviours emerging within this new digital space and reflect on these in the context of existing physical studio practice and pedagogy.
2) to identify which aspects of this digital studio environment offers the most potential for use by traditionally studio-based subjects in the future should the need arise again.

Figure 1. The studio workspace in action

The Design Studio

The enforced move to remote teaching delivery over the last year has brought many challenges to studio-based courses and the traditional modes of delivery that are often associated with UK Art Schools. Central to these challenges has been the loss of the design studio as a focal point for engagement and learning.

The studio, as described by Shreeve et al. (2010), is a space of shared, prolonged, communal activity where the process of making is visible and a focus for comment and debate. Although increased financial pressures on many UK institutions have forced a reduction in the capacity for large discursive studio spaces over recent years, some kind of communal learning environment has usually been maintained, continuing to offer staff and students a studio-based ethos for teaching and learning (Tovey 2015). According to Spruce (2007, p.2) “the studio is not just a space marked studio; it represents a way of thinking and learning” and despite institutional pressures, the ethos of studio learning culture remains a strong ambition for many tutors and students. The popularity of the design studio can be considered through four lenses: Mediating, Sticky, Social and Habitual.

Mediating

Shreeve et al. (2010) describe the studio as a 'mediating artefact', the space itself acting as a key part of a student learning experience. They assert that the space can dictate and affect the content and delivery of teaching and furthermore that it can influence the approaches undertaken by students. It is a space "in which the process of making is visible and a focus for comment and debate by all who wander through" (Shreeve et al., 2010, p.134). According to Spruce: "investment and customisation leads to a sense of ownership of the space itself, and it is at this point that a studio learning culture can begin to develop amongst the student body" (Spruce, 2007, p.3)

Sticky

Orr & Shreeve (2018) describe the studio as an essential part of creating the 'sticky curriculum' in providing a draw for students to return to: "bringing people together to engage in an activity or to see something of collective interest… Stickiness is an attraction or focus creating a social gathering" (Orr & Shreeve, 2018, p6). But Stickiness is also a recognition of the ambiguous and challenging nature of the Art & Design curriculum, described as "a complex web of activities" (Orr & Shreeve, 2018, p7) co-constructed with students wherein they must question and challenge. As such, Stickiness demands that the studio environment is elastic and adaptable.

Social

An essential part of Orr's stickiness is the idea of the studio as a social environment and a place of social exchange. Tovey (2015) suggests that at its best the studio can be a marketplace for ideas and integration which is at the core of design synthesis. Within this view of the studio as a marketplace McCullagh & McFadyen (2015) highlight how tutors can also view themselves as co-explorers with students in the learning space through experimentation and shared learning.

Through its social constructivist approach, (Smith Taylor, 2009 from Shreeve et al 2010) the studio promotes active student engagement and fosters a sense of community ownership and collective voice creating a space wherein the learning of certain skills, attributes and customs are passed-down through observation and participation within a community of shared practices (Lave & Wenger, 1991). Similarly, Tovey suggests that "learning within a community of practice is an expression of identity formation… a process of becoming - in this case a certain kind of creative and critically minded design practitioner" (Tovey, 2015, p.38). One of the principles of this approach is the opportunity provided for formal and informal collaborative peer learning (Marshalsey & Sclater, 2020) where exchanges are dynamic, supporting iteration and experimentation in ideas and thinking.

Habitual

Shulman (2005) identifies signature pedagogies of creative arts education as being "pervasive, routine and habitual" within students' learning experience and goes on to highlight the value of routines in permitting students to spend less time figuring out rules of engagement, and more time focusing on subject matter. These habitual patterns of tutorials and crits help to create what Shulman (2005) describes as "pedagogies of uncertainty", the processes by which the ambiguity of Orr's sticky curriculum is navigated.

Across these four perspectives we can recognise that the studio creates the capacity for a structured, communal, habitual learning process that encourages and scaffolds students' capacity to challenge, experiment and grow. Furthermore, the studio space itself can dictate the way in which this is achieved in unique and idiosyncratic ways. The challenge presented by the COVID-19 pandemic was how to translate some of these aspects of the physical studio into a completely digital environment.

Reflections from Practice

To consider the ways in which Miro might be utilised to both mirror and transform the concept of the studio, we reflect on five projects that utilised Miro between November 2020 and April 2021. In September 2020 (semester 1) we were thrown into the position of again having to rapidly transition from teaching in person to teaching online. In the case of 1st year students, this was their introduction to both University life and the course: its staff, approach and ultimately identity. Our initial response to this was to use the collaborative tools provided and recommended by the University - MS Teams and our existing Virtual Learning Environment, Moodle. After completing the initial 6 week unit with students, it was evident that whilst MS Teams provided an adequate medium for communicating with students, it lacked the capacity to emulate the experience of design studio pedagogy. At this point we sought to use Miro to complement MS Teams, making the shift from sharing a screen, to sharing a space, creating a more robust analog of traditional studio practice. Miro was used as a platform to structure teaching delivery, share creative content and as an environment to generate dialogue amongst students. The projects delivered across our 1st and 2nd year undergraduate courses were broadly similar in terms of scope, following a design process comprising phases of research, ideation and the presentation of final outcomes, but the utilisation of Miro in each instance was different.

Each of the five projects are detailed in Table 1 and include: project context; Miro space created; pre-planned characteristic exchanges; emerging (unplanned) exchanges that occurred within a project. In each case the Virtual Learning Environment (VLE) Moodle was used as the main repository for project handbook documentation, lecture slide recordings and announcements. MS Teams was utilised for verbal dialogue and Miro for interaction and discussion around student's work.

Table 1. Project contexts and characteristic exchanges

	Project A	**Project B**	**Project C**	**Project D**	**Project E**
When	November 2020	January 2021	January 2021	March 2021	March 2021
Project and Unit Title	**Project A** Product Design & Innovation	**Project B** Investigation & Application	**Project C** Understanding Context (RSA Design Awards)	**Project D** Unit X (external project partner)	**Project E** Unit X (external project partner)
UK, UG Level	2nd Year (L5)	1st Year (L4)	2nd Year (L5)	1st Year (L4)	2nd Year (L5)

	Project A	Project B	Project C	Project D	Project E
No. Students	10	56	24	54	64
Mode of delivery	Blended	Blended	Online	Online	Online
Modes of practice	Students worked individually	Students worked collaboratively and individually	Students worked individually	Students worked collaboratively	Students from a range of creative disciplines worked collaboratively
Notes	Students who had previously worked together	Students from two pathways and unfamiliar with each other	Students from Project A	Students from Project B	Students from eight different disciplines. Cohort was unfamiliar to each other.
Exchanges in space					
Icebreaker / Sandbox	x	x			
Individual Pin Up / Crit	x	x			
Group Pin Up / Crit				x	x
Individual Workshop Activity	x	x			
Shared Workshop Activity	x	x			
Individual Tutorial	x		x	x	
Group Tutorial/Seminar			x	x	x
Instructional Exchange			x	x	
Tutor-led Discussion			x	x	
Asynchronous Exchange			x	x	x

Summary of Characteristic Exchanges on Miro

Icebreaker/Sandbox: Tutor led activities introducing students to Miro software but also to the processes of sharing and commenting on peer work.

Individual Pin-up/Crit: Opportunities to share work and elicit feedback from tutors and peers. Feedback would typically manifest through the use of digital post it notes.

Group Pin-up/Crit: Opportunities to share work and elicit feedback from the 'client', tutors and peers. Feedback would sometimes manifest through the use of digital post-it notes but was largely oral.

Individual Workshop Activity: Highly structured design-process driven activity, delivered to the whole group but completed individually with feedback from peers.

Shared Workshop Activity: Highly structured design-process driven activity, delivered to and completed by small groups with feedback from peers.

Individual Tutorials: 1-2-1 dialogue with students, discussing progress and planning forward actions. Tutorial conversations were driven through synchronous review of work placed on the Miro board, using virtual post-it notes to capture comments and agreed actions directly alongside the work.

Group Tutorial/Seminar: Dialogue with students to discuss overall progress. Sessions were generally hosted on MS Teams but students would often utilise their own private group Miro boards to show progress. Again, feedback was largely oral.

Instructional Exchange: Delivery of the weekly primer activities. These were each located on the Miro board within a defined space for the activity and presented at the launch of each session, enabling students to respond individually within the context of a directed activity.

Tutor-led discussions with focused student groups: Posing questions and eliciting responses in moderated exchanges to prompt peer review, externalise viewpoints and promote self-reflection. Outputs from these group discussions were usually imported onto the main Miro board to prompt peer review from the whole group and self-reflection moving forward from the session.

Asynchronous Exchange: Via post-it notes placed onto student's work outside of taught sessions. Though this was driven mainly by tutors to prompt thinking and suggest forward actions, some students did engage in peer-to-peer exchange, posting comments on each other's work and also posting replies to tutor comments.

Evaluation

Analysis of all the activity in Miro established that the platform offers significant benefits in use, both in the absence of, and potentially in parallel with, co-located working. Within each project the Miro spaces quickly created rich, shared, visual repositories that reflected different journeys through the design process. These spaces afforded opportunities for participants

including staff, students and external guests, to engage with the projects and each other in new and often unexpected ways. The spaces also demonstrated a permanence and accessibility that would be hard to recreate in a modern physical studio environment. A key aspect of this was the way in which the digital spaces overcame barriers that can affect physical studio environments such as time, space and money.

Within Miro, participants could utilise the spaces both highly synchronously - working collaboratively at the same time, or highly asynchronously - accessing the space independently outside of structured lesson times, in effect creating a 24 hour studio space. The scale of these visual repositories was unprecedented and unachievable within a traditional physical studio environment, particularly in light of the pressures inherent in many modern art school studios wherein space is shared and pin-up space is limited and time-bound. The cost to realise this kind of visual repository in a physical environment would have been prohibitive both to the programmes and to students when considering the costs of printing imagery, post-it notes, paper, pens, markers, etc. Furthermore, the quality of the work in the repository did not diminish over time (as perhaps a cluster of post-it notes on a wall might). Not only was it maintained in its original form without any signs of ageing, it was also easy for it to be revisited, recategorized and remixed throughout the project with little or no impact on resources.

Observing the utilisation of these spaces revealed the emergence of a series of new behaviours and opportunities. In the Product Design domain, we identified insights in four significant areas. (1) Making the design process explicit, (2) Making the student journey visible, (3) Communities of practice, (4) Independence and Ownership.

Making the Design Process Explicit

The use of Miro to locate both collaborative group activities and individual student's projects has provided a rich visual canvas for tutors and students across all projects. In particular, the ability to visually formalise the design process has emerged as a key characteristic of digital delivery. Project D shown in Figure 2, viewed on full zoom is an example of this. In such ways, these visualisations of the design process in Miro help students to make tacit design process knowledge to become codified and explicit, and in this sense, the space became a mediating artefact. The visual representation of the design process in this dynamic (micro to macro) format also enabled a clearer understanding of the relationships between the various methods and stages of the process to be recognised as students ‘joined the dots’ of their own mental model of the design process.

Figure 2. Project D collaborative Miro board space

Within project B, a series of mapping exercises were particularly useful in engaging the whole group as one, whilst enabling individual opinions, preferences and character traits to be manifested, observed and discussed within a mediated space. When taught workshops exposed students to new design research approaches and thinking methodologies, the frameworks for these, such as 'The Thing from the Future' game in project B became touchstones that could be referred to and revisited throughout the project, helping to structure and guide subsequent development as shown in Figure 3. Whilst these activities are similar to those delivered in a co-located workshop setting, the fact that digital workshop materials stayed in-situ on the Miro board and could be accessed repeatedly by students throughout the project allowed a familiarity and understanding of the process to grow over time.

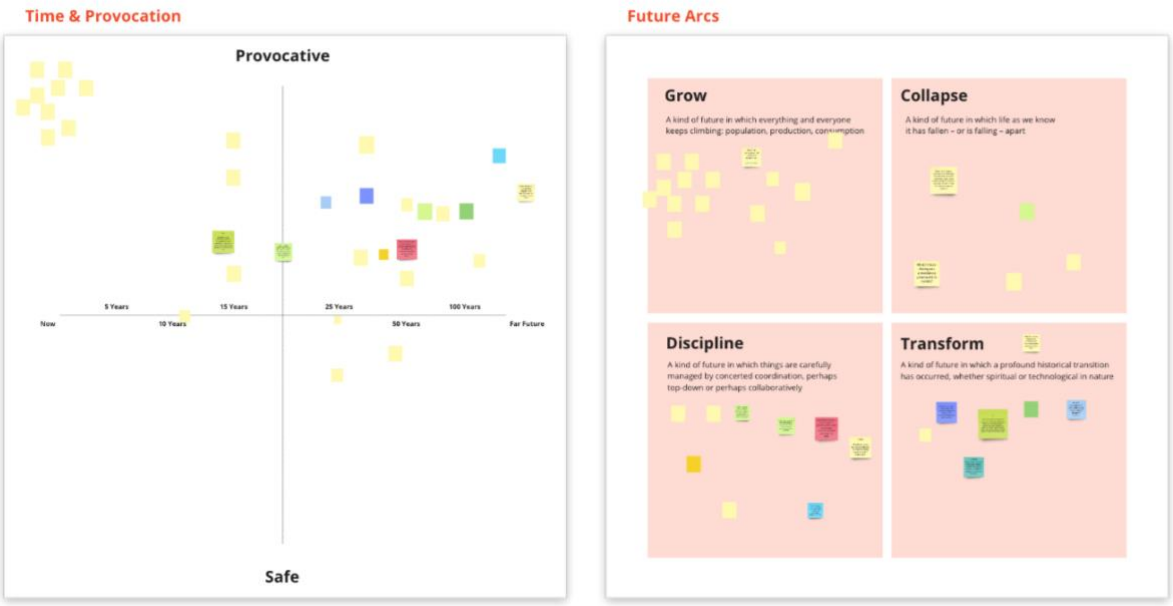

Figure 3. Guiding frameworks used as reference points throughout Project B

Miro tutorial spaces that were often created independently by individual students and quickly became an effective repository to share visuals from other Miro workshops. For example, Figure 4 shows imagery generated within a creative methods workshop being used by a student in a tutorial as inspiration for design ideas. The simplicity of quickly sharing information enabled tutors more time to explore ideas in more depth with each student. Inserting lecture slides directly into Miro spaces also became a pragmatic way to make explicit connections between teaching materials and the students design process and reference methods in direct relation to the students work. Similarly, live sourcing of research, inserting websites, visuals or movies could be used during tutorials and/or referenced afterwards asynchronously.

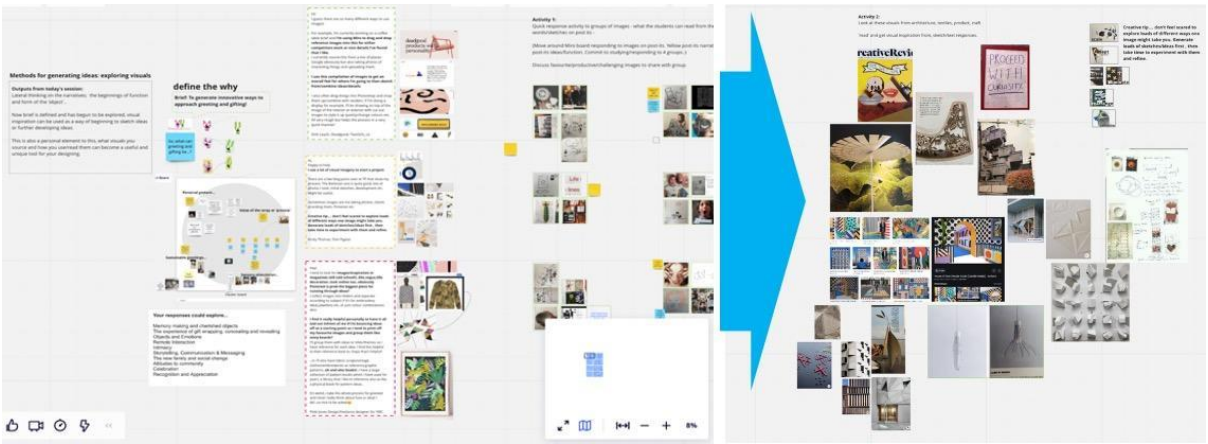

Figure 4. Application of workshop materials to inform ideas generation

Making the Student Journey Visible

Just as the design process was made explicit by the digital space, so too was the journey of each individual student. From initial observations and research through development to final presentation the opportunity to chart each student's personal journey and progress through the design process has proved highly valuable.

In fostering the sense of a learning journey, project B was specifically structured in order that workshop activity enabled the students to build contextual frameworks around which they could make sense of their design work. At the same time repetitive crit structures at the start of the project created a visual journey for each student that enabled them to reflect on and make sense of their decision making throughout the project. Though, as structured workshops and activities are often quite fast paced it can sometimes be hard for students to comprehend and make sense of the processes at play rather than just participate in the workshop. Asynchronous access to the boards allows a greater capacity for students to revisit the processes, taking the time to review their peers' work and to ensure they understood the activity, in some cases students would re-do the activity to satisfy themselves that they had understood the meaning or value of the activity.

Similarly, collaborative group sessions delivered as part of project C using Miro as a whiteboard space shown in Figure 5, supported an externalising of thoughts and ideas early in the unit's delivery. These activities highlighted the potential breadth and scope of each brief within the

tutor-led sessions and also enabled students to return back to the whiteboard spaces to compare opportunities and design directions. The ability to visually manipulate, organise and reorganise post-it note comments over a period of time was very useful in defining clear forward actions for students to explore and to return to at moments of decision making later in the projects.

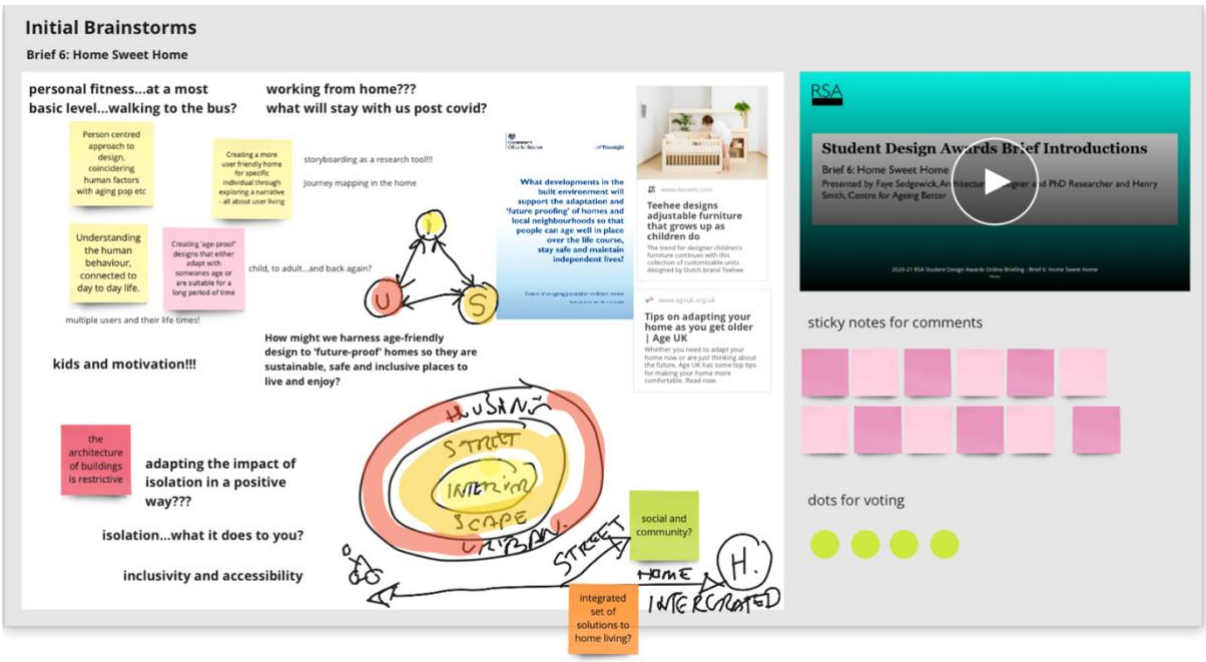

Figure 5. Using Miro as a collaborative whiteboard space

From a teaching perspective, the ability to quickly refer back to previous workshop exercises with individual students or peer groups created the opportunity for rich discussion and dialogue. The visual overview offered by the Miro boards also proved useful when feeding back to other staff, reviewing a project's progress or issues to address in the next teaching week.

Working collectively within a digital space throughout a project, as in project C, exposed students' work to each other in a way not previously experienced. This was challenging and potentially uncomfortable for those who lacked confidence. Over a period of weeks there became some noticeable gaps in the boards where students had not posted work following a session. Anxieties surrounding the posting of work were discussed and although the value of the exercises were acknowledged some did not post work onto the boards beyond initial group activities, but continued to engage in tutor-led workshop sessions throughout the project's delivery.

Communities of Practice

Fostering communities of practice (Lave & Wenger, 1991) to support learning is recognised as a fundamental aim of the design studio environment and is at the heart of the social learning ethos as described by Orr & Shreeve (2018), Schulman (2005) and Tovey (2015). As we have highlighted, the capacity of the Miro space to make design processes and student learning journeys visible, shared and explicit helps to create communities with shared understandings, approaches, and skills.

Work within the Miro environments often alternated between collaborative and individual activity. This rhythm of behaviour created space for individual expression to emerge through habitual use whilst providing the scaffold and support that peer learning provides. Tutor-led workshops often engaged students as individuals but encouraged them to support each other to make sense of their individual responses through group discussion and reflection. This highlighted individual approaches and ideas whilst simultaneously fostering shared understanding and knowledge transfer. In such cases the ability to easily refer to each other's work in the shared space was highly advantageous.

In projects A and B, a series of mapping exercises were used intermittently throughout the duration of the projects. These served various purposes, but consistently provided a snapshot of the whole cohorts thinking at a given point in time. In one example shown in Figure 6, students were asked to map their own levels of excitement about the project and their approach to it relative to the rest of the group. For example, capturing the 'excitement' levels at the start of the workshop and then revisiting it towards the end of the workshop helped to visually demonstrate both the collective 'mood' of the studio but also the progress that had been made individually and collectively, fostering a sense of a shared achievement. These 'zooming out' exercises were useful in creating a break from the intensity of the individual activities whilst also providing an at-a-glance overview of the collective mindset. Establishing these viewpoints helped to identify both commonalities and differences, ultimately leading to better understanding within the group.

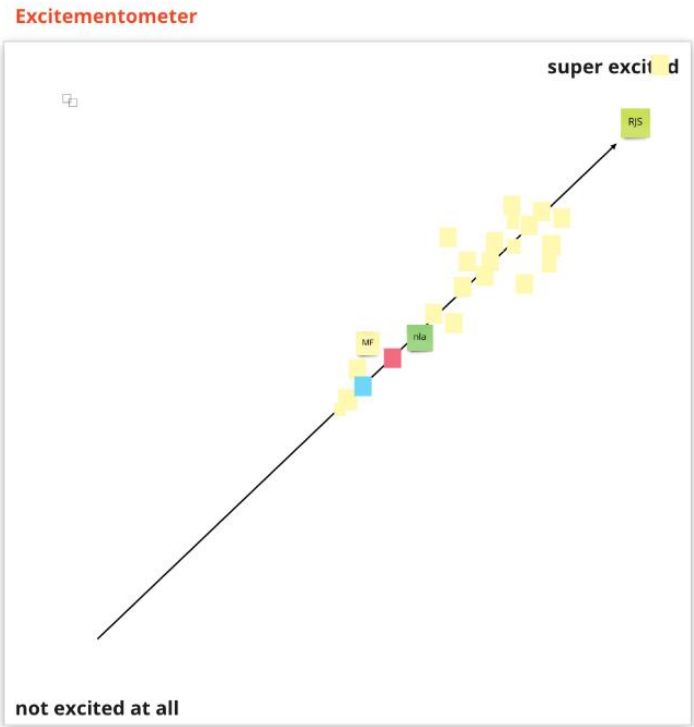

Figure 6. Mapping levels of excitement about the project

Peer review, feedback and reflection was widespread and consistently thoughtful, constructive and critical. This helped to foster a sense of community amongst the cohort, wherein students

were able to work together to present scenarios and approaches for problem solving, further research, new techniques and alternative approaches. These moments of synchronous collective activity provided a unifying feature within the context of students busily progressing their individual project work. For example, a short series of peer review questions as seen in Figure 7, afforded everyone the permission to look beyond the immediacy of their own projects and engage in a collective exercise that highlighted the benefit of social exchange as part of their learning experience.

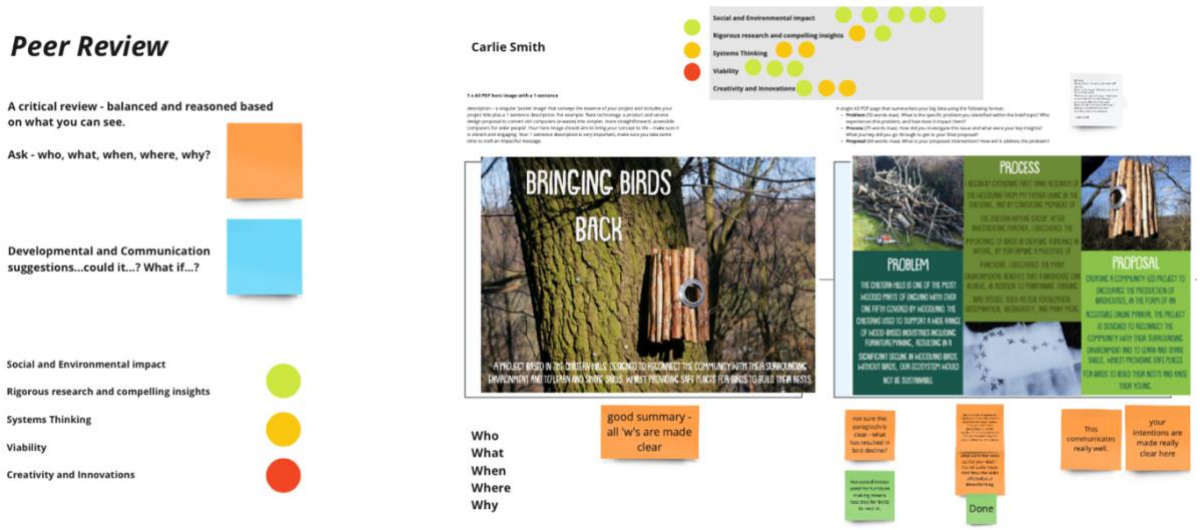

Figure 7. Peer review exercise within Project C

By contrast, the capacity to engage with the Miro boards asynchronously afforded students the opportunity to revisit the space outside of timetabled sessions, observing and drawing on others work to enable them to develop their own. The village green and wedding tables formats as shown in Figure 8 were designed to explore and further facilitate peer-to-peer exchanges at different stages within the unit's delivery. In particular to promote conversations with students who may not have talked to each other before.

Figure 8. Alternative peer exchange formats used within project C Miro board space

The spaces could be seen to support and nurture a communal social-studio environment, providing a focus and meeting point for idea development and exchange. Tutors were able to

observe the way that individual students approached their work and how they interacted with each other in groups whilst students began to establish and develop relationships, creating the capacity for shared exploration and conversation. These spaces support the development of a community of practice by enabling individual development within the frameworks of explicit design process and the scaffold of peer learning and support.

Independence and Ownership

Alongside the emergence of communities of practice, we also observed students developing their own independence within, and taking ownership of, the (digital) studio space. As previously stated, the scaffold of habitual approaches and peer learning, provides mediation via structured spaces and activities creating a supportive environment that enables individuality to emerge and be expressed.

Individual workshop activities and peer feedback allowed the students to start to express their own identities and interpretations of the brief. These exercises were created in such a way as to provide students with their own personal workspaces analogous to those typically found in a design studio. In project B, the first workshop exercise engaged students in mapping their individual interests in order to define smaller working groups with common interests. The personal nature and shared interests inherent in this task led to rich discussions among the groups and ultimately provided the students with some control over the project, evidenced not just in the themes and directions it exposed but also in the different approaches taken to map and organise their shared thinking.

As independence blossomed, it was also interesting to observe a degree of ownership of the space emerge in some students, wherein they would take control of how they utilised the space during tutorials, in some cases establishing new (breakout) spaces in which to share more work or explore tangential ideas. This was also evident in group activities where work grew organically beyond the predefined spaces that were set out, as in Figure 9, where the semi-infinite canvas provided students the adaptability elasticity to explore and personalise the space in much the same way you would when using a physical space. Moving ‘beyond the board’ enabled ideas to flow and connections to be discovered, highlighting relationships between seemingly disconnected aspects of a subject. These organic activities prompted further materials to be quickly researched and posted onto the board within the sessions, promoting deeper exploration and understanding of the subject. Interestingly this approach extended to Project E. Whilst this project predominantly used Miro as a crit space the student groups, independently and unprompted, utilised the spaces to work together. Following the first crit some groups went 'beyond the board' to utilise the space around their presentations to create shared workspaces. Between this crit and the next, many of the groups established their own private co-working spaces in which to work - effectively taking control of the ‘studio’.

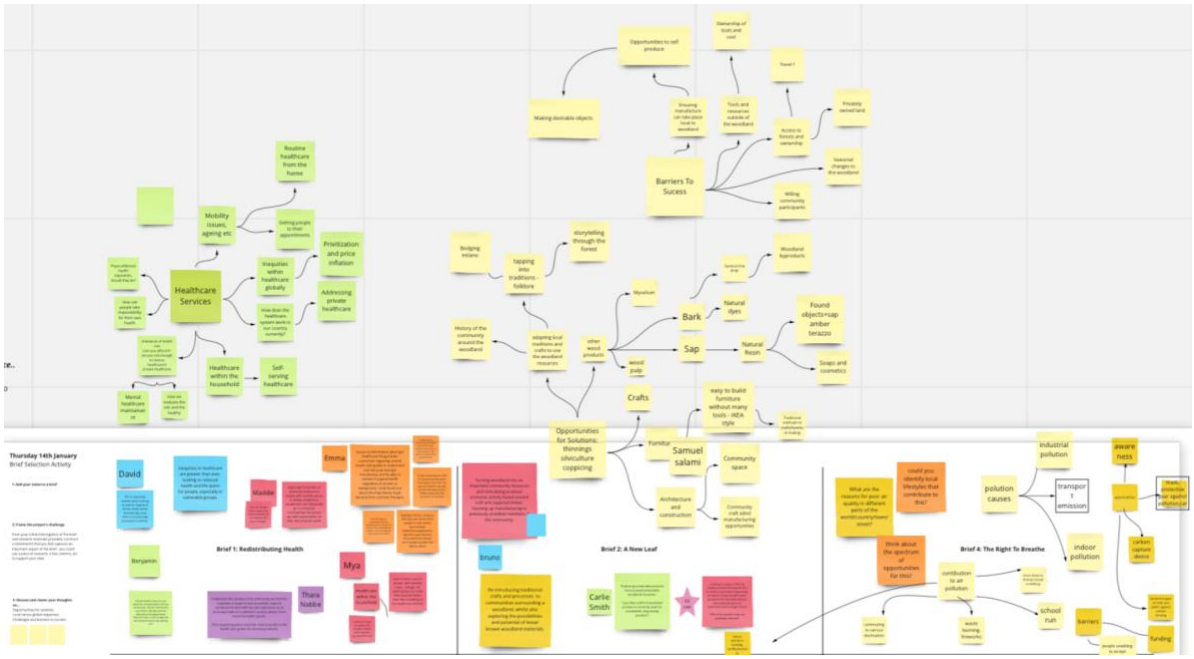

Figure 9. Organic growth of ideas and investigation

Another example of this emerging independence could be seen in the way in which students presented their work. In Project B students were not directed as to how this work was presented at crits, this encouraged a lot of experimentation. Whilst some students opted to produce presentation boards/slides and import them into Miro, others opted to use Miro to organise their research - taking advantage of the opportunity to create multimedia often non-linear presentations. The nature of the space ensured that these alternative approaches were shared to all students and could be adopted and remixed by other students in subsequent presentations. In many ways these approaches were more engaging, and by their nature invited interaction and re-organisation of their components, they created the capacity for narratives to be altered and amended. Indeed, a key aspect of the digital studio is that it afforded the opportunity for students to easily move work between boards. Visuals and feedback from tutorials and crits could be carried forward onto individual student work areas to enable them to reflect on and develop their thinking and practice.

Another interesting observation was that the digital space was particularly effective for interdisciplinary groups, like those in project E. One of the issues associated with the creation of strong studio cultures is that the strength of these cultures can in fact create barriers to collaboration. At the most basic level, when physical studio space is scarce, it can be difficult to enable multidisciplinary groups to meet within subject specific studios. Likewise, there can be power dynamics as to which studio students should meet in. The neutrality of the shared digital space proved very successful, with groups working better together than their peers had on the same project in previous years.

In addition to neutrality, part of this success was due again to the asynchronous nature of the studio and the degree to which this enabled groups to come together when it was convenient for them or indeed to enable individuals within the group to contribute to the group work asynchronously in a way that would not be possible within a physical studio environment.

Again, the asynchronous nature of the board was effective in enabling students the capacity to revisit and repeat activities in their own time. This also afforded students the opportunity to miss a class. Students who were absent from a workshop or class could review the work of their peers and complete the activity independently in their own time, which may not be within typical 9-5 studio hours. Whilst this might not be ideal for developing a community of practice, it does enable the student to take ownership of their individual learning journey creating a robust space for individuals, and individuality, to thrive.

Recommendations and Concluding Remarks

The reorientation to remote teaching over the past year has proven to be both challenging and compromising in the context of delivering studio-based education. However, it has also proven that through adversity comes new insights, and in our case, the adoption of Miro as an analog to the physical design studio has revealed new behaviours and opportunities. Considering the design studio as a signature pedagogy that provides mediating, sticky, social and habitual exchanges in supporting the delivery of design education, this study has identified mirroring characteristics within the digital studio environment that have potential to be utilised either where campus-based teaching is required to be delivered remotely or as part of a blended learning delivery.

Visualise the Process to Create a Mediated Social Space

The capacity to visualize design processes and dynamically navigate through projects within the digital Miro space has been transformative in supporting the delivery of remote teaching. Visualisation of design processes enabled the creation of digital scaffolds within which we were able to construct workshops, experiment with modes of thinking and index design methods. Visualising the whole project journey in an accessible digital space has positively impacted students' ability to use design methods and frameworks to support their development, and in the process generated a greater sense of awareness of their own learning journeys.

Foster Habit and Routine to Make it Communal

Students working both independently and collaboratively within burgeoning remote communities of practice reflect the social aspects of physical studio participation, drawn to a common place that holds attraction. Changing the nature of their engagement from sharing a screen to sharing a space has perhaps emerged through a growing sense of routine and habitual use, in line with Shulman's (2005) identification that working out the rules of engagement creates the time, and confidence to experiment within the digital space. Similarly, the asynchronous use that is evident in several of the projects suggests that the flexibility to access and share content beyond taught lessons has emerged as a very positive mode of exchange not always afforded by physical studio environments.

Enable Autonomy and Ownership to Make it Sticky

Student autonomy, ownership and experimentation within the Miro spaces has developed over each project as their familiarity with the platform has grown.

Utilising the elasticity of the digital space and its ability to bring together different media into a shared, accessible environment mimics the use of physical studio space, wherein the arrangement and application of space is adaptable to the required need. Thus, creating the

liminal spaces for ideas sharing and discussion to develop as an environment for sticky exchanges between students, tutors and their subject.

Looking ahead, it is still unclear how our institutions will best utilise the learning and experiences that have emerged through this period of forced separation from campus. We will all welcome a return to campus life however it is clear that some pragmatic approaches to teaching, adopted through necessity, can hold lasting value beyond crisis modes of teaching. The sharing of knowledge, ideas, thoughts and exchanges within a digital format such as Miro does not tarnish over time as in a physical studio environment, they remain visible and accessible to be returned to by each student in their own time, supporting sticky learning in connecting the application of skills, knowledge and understanding across the curriculum. Building upon our experiences, the augmentation of physical and digital spaces to create symbiotic relationships between platforms such as Miro and physical studio environments will be an exciting next step in offering a truly optimised learning experience for the future.

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Is the Design Studio Dead? - An International Perspective on the Changing Shape of the Physical Studio across Design Domains

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Abstract
The process of moving the physical design studio experience, where social interaction is a guiding principle, into a detached virtual environment during the Covid pandemic has prompted design educators to re-evaluate what constitutes a traditional studio-based learning system. This shift is based on classroom experiences after design educators moved their courses online as physical classrooms closed. Early research findings indicate that design educators and students adapted surprisingly well to an online classroom during the pandemic. But is this equally the case across all design domains? The author argues that it is unhelpful to generalize across design domains when setting out to construct alternative digital learning and teaching environments. This study contextualises varying responses to the online design studio and offers a unique international perspective on differences in design domains impacting future plans to offer blended or online learning. The research is underpinned by the epistemology of pragmatism. The interpretation of data is based on surveys filled out by 90 highly experienced design educators representing eight design domains in seven countries. Results indicate a clear shift toward long-term acceptance of select online elements even in design domains focused on physical studio skills. It is clear that design domains will differ in their adoption and development of blending face-to-face and online teaching in the future.

Keywords
design studio transformation, online design education, blended design studio, design domains, COVID-19 pandemic

Introduction
It has been something of a sink-or-swim situation implementing online design teaching during the global Covid-19 pandemic. For many design educators this transition, now well into its second year, is a new experience that raises important pedagogical issues about how to teach design online. These issues center on collaboration, critiques and hands-on design practices; the very definition of studio practice in its many forms has been the subject of experimentation and integration of online elements to cope with the closure of face-to-face studio classes, workshops and physical spaces.

Early research findings indicate that design educators and students adapted surprisingly well to an online classroom during the pandemic (e.g., Ahmad, Sosa & Musfy, 2020; Fleischmann, 2020c; Marshalsey & Sclater, 2020; Yorgancıoğlu, 2020). Initial feedback from students and design educators from research conducted during the pandemic has demonstrated both positive and challenging experiences with digital delivery tools applied to studio practice. On a

fundamental level these experiences teaching design online have a direct bearing on the future of design education. There are ongoing misgivings about online design courses interfering with the creative process. Yorgancıoğlu (2020, p. 34), for example, observed during the pandemic that digital tools can limit "potentials of the intuitive, spontaneous or experimental dimensions of design learning that are embedded in design education". Even before the pandemic, design educators were sceptical about online courses because of design's face-to-face interactions, feedback and iterative processes (Bender, 2005; Fleischmann, 2015; Park, 2011; Wood, 2018). Conversely, there have also been strong advocates for pushing design pedagogy further into the online future. Petkas (2012), for example, argued that design courses are not moving fast enough to evolve with emerging technologies while Dreamson (2020, p. 495) declares that "online design education is not the next best alternative but an emergent design studio".

Overshadowing this debate are clear differences in design domains and their particular studio pedagogies that might influence the adoption of online practices in the design classroom. The author argues that it is unhelpful to generalize across design domains (e.g., Graphic/ Communication Design, Product/Industrial Design, Fashion Design, etc.) when setting out to construct and implement alternative digital teaching and learning environments. A more refined analysis is necessary that focuses on potential differences and areas of agreement across design domains regarding online integration, particularly in studio-centric courses.

The research presented here investigates these potential differences by exploring the online teaching experiences made during the pandemic across design domains and how future plans to offer blended and/or online design education might be influenced by realities of those pandemic experiences. To gain a clearer picture of these dynamic changes, 90 design educators from Australia (29), Scandinavia (19) (Denmark, Norway, Sweden), the United Kingdom (17), New Zealand (14) and the USA (11) provided survey feedback on their online teaching experiences and views on how to move forward after the pandemic or when it has eased.

The participants in this research represented the following design domains: Graphic/Communication Design (30), Product/Industrial Design (17), Interaction/Interactive Design (11), Game Design/Animation (9), Design Thinking/Social Design (7), Interior/Spatial Design (6), Design Research/Theory (5), and Fashion Design (5).

The author acknowledges that specific design domains are represented by smaller sample sizes, however in the context of the total responses, they yield valuable insights into acceptance and doubts regarding online design pedagogy.

Design Studio Pedagogy and Culture

Researchers often describe the design studio as based on the 'atelier' method from the 'Ecole Des Beaux Arts' model (1819-1914) and adapted by the influential Bauhaus School (1919-1932). This traditional model builds on a master-apprenticeship relationship; the master (educator) shares their knowledge and skills with the apprentice (student) and guides students in their creative development (e.g., Broadfoot & Bennett, 2003; Crowther, 2013; Fleischmann, 2016; Hart, Zamenopoulos & Garner, 2011; Lee, 2006; STP, 2009). This traditional view builds on a foundation of a culture/community in a physical space where face-to-face feedback is an essential part of the process (e.g., Crowther, 2013; Fleischmann, 2016; STP, 2009). The

traditional studio features "learning-by-doing" (Schön, 1987) via the experiential learning model (Kolb, 1984); observing, discovering, and experience which often involve doing, making and reflective thinking (e.g., Marshalsey & Sclater, 2018); the physical studios, which can include workshops and laboratories, are often collaborative and facilitate peer interaction (Daniel & Fleischmann, 2014) and a type of camaraderie (Hart *et al.*, 2011). Therefore, it is argued that the studio has an important social dimension (e.g., Morkel, 2011; Shreeve, Sims & Trowler, 2010; Shreeve, 2011). Wragg (2020, p. 2288) maintains the studio is often still portrayed as space where "inexplicable magic" takes place.

Before the pandemic gripped the world, some design educators had already been considering how technology and other factors were re-shaping the studio culture at the heart of design pedagogy. Researchers have highlighted "far-reaching transformations from the original studio context" even pre-pandemic (Marshalsey & Sclater, 2018, p. 96). In many institutions, for example, the lack of funding has put pressure on design programs to expand class size, and consequently reduce dedicated workspaces for students (Fleischmann, 2016; Jones, Lotz & Holden, 2020; Marshalsey & Sclater, 2018). While this reduction of workspaces largely depends on funding models which can differ across countries, Wragg (2020, p. 2290) argues that this studio downsizing has meant the reduction in the social interactions at the heart of traditional studios with students spending less time on campus and hence a "community is not a guaranteed outcome". However, there is a stubborn belief among many design educators that the "studio has not changed over the past century, regardless of significant criticism and major technological developments" (Sopher, Gewirtzman & Kalay, 2019, p. 2122). Although these beliefs express a view that design is stuck in the past, design itself is dynamic in nature and has been evolving as a studio practice.

The Studio's Incorporation of Technology

Online education has three commonly understood teaching/learning modes: asynchronous, a self-paced course where students access and engage course materials online on their own schedules; online synchronous, where students and the educator are online at the same time (which during the pandemic some started to refer to as 'remote teaching'); and blended, where students experience a mix of online and face-to face teaching in their course. A 'course' in this paper refers to a unit of study which depending on university and country is also called a 'subject' or 'paper'.

The use of online technology in the design classroom is not a new or revolutionary phenomenon. Technology-enhanced design education using the flipped classroom (e.g., Coyne, Lee & Petrova, 2017; Fleischmann, 2020b; Yick et al., 2019) and fully online courses (e.g., Fleischmann, 2019; Jones, Lotz & Holden, 2020; Watson, McIntyre & McArthur, 2009) already existed pre-pandemic. Design educators have also used social media for communication and critiquing (e.g., Schnabel & Ham, 2012; Güler, 2015; Fleischmann, 2014; Filimowicz & Tzankova, 2017); the Virtual Design Studio (VDS) has been active for some time (e.g., Bradford, 1995; Kvan, 2001) and social interaction in online design studios has been explored (Lotz, Jones & Holden, 2015). While various institutions have already been trialing online and blended design education models for years, the traditional pedagogies were still prevalent pre-pandemic in global design education. In fact, the author found in previous research there was a significant hesitation among design educators to introduce online courses (Fleischmann, 2015) and that

blended learning was experienced as the middle ground for Graphic/Communication Design at the author's institution (Fleischmann, 2020a).

This study explores the experiences of design educators in different design domains when implementing online teaching in the studio or replacing it altogether. Responses are critical to the understanding of the evolution of the physical design studio during the pandemic and whether these new practices will remain viable. The author argues that we need to be more rigorous with conclusions based on larger samples (if possible) across representative design domains; a successful online experience with ten students (e.g., Wragg, 2020) might not translate into the same experience with 30 or 40 students and may not be equally successful across other design domains. Jones, Lotz and Holden (2020, p. 4) argue that the range of studio types that exists across design domains have different features, characteristics and functions that "come [with] a range of pedagogical assumptions and variances" which are hardly ever considered. These variances and assumptions are not always articulated in design education research but are necessary to make more informed decisions about our online future.

A nuanced approach to gauging the acceptance of the online design studio is needed because "no 'one size fits all' online design education model exists" (Fleischmann, 2019, p. 4) and what may work in Graphic/Communication Design may not work in Product/Industrial Design (Fleischmann, 2019). Wragg (2020, p. 2287) also argues that "barriers to online design education relate to the traditional studio experience," and that the sole way to test digital alternatives is to teach online. Dreamson (2020, p. 495) predicts that physical "design studios could no longer be the mainstream route for career development" and argues, although physical design activities "could not be replicated to online activities…these physical activities could not stop digitizing design education".

With the COVID-19 pandemic still exerting its influence on design education, there is the opportunity to explore affordances and shortcomings in more depth and compare them across various design domains pinpointing more clearly how design studio realities and experiences may transform design's pedagogical future.

Methods

This research explores how a representative group of international design educators are responding to shifting their courses to an online delivery during the Covid-19 pandemic. Due to the lack of research that relates online design education specifically to different design domains, this study explores the questions: How have the experiences of teaching online design courses during the pandemic altered perceptions about applying those experiences to studio pedagogy and how do those experiences and perceptions differ across design domains?

To help answer these questions, this research is underpinned by the epistemology of pragmatism (based on Pierce and Dewey) which as a philosophical stance "understands knowing the world as inseparable from agency within" (Legg & Hookway, 2020). The researcher could therefore select methods that suit the real world practice nature of the situation (Morgan, 2014; Teddlie & Tashakkori, 2009) on subject experience, a fundamental precept of pragmatist epistemology (Kaushik & Walsh, 2019). An online survey with closed and open-ended questions was selected as the most appropriate method to gather feedback from a

global audience in a short period of time. The general approach was inductive and had an overall drive of exploration and discovery (Morse & Niehaus, 2009). The researcher initially set out to explore the experiences of design educators in general and how these might influence the future shape of design education more broadly. After an initial review of the survey feedback, the data revealed potential differences between design domains as a path worthy of further exploration. Although a few researchers such as Jones, Lotz and Holden (2020) highlight that studio types with different characteristics exist across design domains, research exploring online or technology-enhanced design teaching and learning tends to treat design education more in a general sense and often ignores the peculiarities of design domains.

The interpretation of quantitative and qualitative data is based on survey feedback from 90 design educators representing seven countries (Norway, Sweden, Denmark, New Zealand, Australia, United States, United Kingdom) with eight design domains included in the analysis: Graphic/Communication Design, Product/Industrial Design, Interaction/Interactive Design, Game Design/Animation, Design Thinking/Social Design, Interior/Spatial Design, Design Research/Theory, and Fashion Design. The survey was conducted during (May-September 2020) with educators having already experienced at least one online teaching period during the initial phase of the pandemic.

The analysis for quantitative data obtained using the online survey was done by utilizing existing tools from the survey platform (SurveyMonkey) which automatically provided basic statistical data, such as the tally of response totals, percentages and response counts. Design domains were identified from survey responses and grouped accordingly for analysis. This allowed for triangulation of sources and data, which provided corroborating evidence for differences discovered and the conclusions drawn about design education more broadly (Bazeley, 2004; Johnson & Christensen, 2008; Teddlie & Tashakkori, 2009). Qualitative data obtained from responses to open-ended questions in the survey were coded using a content analysis. Re-occurring themes within each design domain were summarized and provide deeper insights beyond the statistical data.

Findings

The Covid-19 pandemic forced most design educators into a new reality that challenged their perceptions of the physical design studio. Design educators who filled in the survey were highly experienced with about three-quarters of participants having more than ten years experience in teaching design practice and theory. Their written comments included in survey responses offered strong opinions about the effectiveness of online teaching approaches based on their experiences teaching during the pandemic. Of the survey participants, 44% had some experience teaching design online pre-pandemic, and 42% had no prior experience in teaching classes online. Only 14% of design educators considered themselves as highly experienced in teaching design online.

To establish baseline preferences, survey participants were asked their view of teaching design classes online versus face-to-face *before* the pandemic. Overall, 63% of design educators across all design domains preferred face-to-face classroom teaching; 24% chose “other” which in written responses essentially described a blended teaching option mixing online and face-to-face-teaching and learning within one course/subject offering; while 13% agreed that design

can be taught online. These 13% represent 12 design educators of whom six were already experienced in online design teaching; four had some experience and two had no experience in teaching design online.

Table 1 yields insights into variations in preference pre-pandemic for face-to-face (f2f) teaching when analyzed by design domains in the survey group.

Table 1. Pre-pandemic perception of online teaching by design domain

Q: Thinking back before the COVID-19 crisis, what was your view on learning and teaching design in an online environment? I thought design…			
Design domains	**is better taught f2f** % (number of educators)	**can be taught online** % (number of educators)	**can be taught blended** % (number of educators)
Product/Industrial Design	82% (14)	-	18% (3)
Fashion Design	80% (4)	-	20% (1)
Design Thinking/Social Design	72% (5)	14% (1)	14% (1)
Interior/Spatial Design	67% (4)	33% (2)	-
Design Research/Theory	60% (3)	-	40% (2)
Graphic/Communication Design	57% (17)	13% (4)	30% (9)
Game Design/Animation	56% (5)	33% (3)	11% (1)
Interaction/Interactive Design	55% (6)	18% (2)	27% (3)

Table 1 shows there is a marked variance across design domains regarding teaching modes preference pre-pandemic. Physical workshop-based studio domains such as Product/Industrial and Fashion Design respondents clearly favor face-to-face. Respondents from design domains which arguably produce more digital outcomes have a wider acceptance of online and blended teaching and learning. For example, in Graphic/Communication Design roughly a third of respondents supported blended teaching and learning (30%) pre-pandemic.

Despite their preferences for physical classrooms, the pandemic required all survey respondents to move all or significant parts of their classes to online delivery platforms because physical classes and studios were closed as a requirement of social distancing and lockdowns. Many internet communication and collaboration platforms, such as Zoom and Miro, have since become critical tools for connecting remote students, educators and tutors and continue to be used for studio activities such as critiques and project presentations. Other respondents relied on Learning Management Systems (e.g., Blackboard, Moodle) to set up virtual classrooms,

deliver course materials and assessments. The pandemic has required design educators to improvise, experiment, and implement digital solutions, even in physical workshop-dependent courses. However, the majority of survey respondents (77%) agreed with the statement that "There are some skills and content that I cannot teach online". Comments below represent challenges encountered by design educators when moving studio practices online:

> *"Hands-on in studio experiences are impossible to teach. Anything that requires specialized equipment or techniques is a total loss in the online environment."*
>
> *"Mostly the physical workshops: Letterpress, Screen printing, Laser Cutting, Arduino, Printing, Studio Photography, etc. If you are working purely on a 13" laptop it's really difficult to get a proper sense of scale for packaging and general product design."*
>
> *"Making prototypes and models, interacting with materials and machinery, feeling and seeing real objects is indispensable in an Industrial Design degree. Social interaction planned and by accident is also an important aspect, but not just within a design degree."*

The sample comments make clear that 'making' skills involving equipment and physical materials are difficult at best to teach remotely and social interaction studio skills are diminished online. Results across design domains reflect those comments in Table 2.

Table 2. Does fully online teaching work across design domains?

Q: Could you teach all content and skills online?		
Design domains	**No, I could not** % (number of educators)	**Yes, I could** % (number of educators)
Product/Industrial Design	100% (17)	-
Interior/Spatial Design	100% (6)	-
Fashion Design	100% (5)	-
Interaction/Interactive Design	82% (9)	18% (2)
Design Thinking/Social Design	71% (5)	29% (2)
Graphic/Communication Design	70% (21)	30% (9)
Game Design/Animation	56% (5)	44% (4)
Design Research/Theory	20% (1)	80% (4)

It is evident in Table 2 that hands-on design domains (Product/Industrial, Interior/Spatial, Fashion) unanimously reject online as a viable platform for teaching all their skills and content.

Amongst the other design domains, almost a quarter of all respondents agreed with the statement "they could teach everything online" while the rest disagreed with the statement. Those who agree with teaching everything online are concentrated in domains that create more digital outcomes and are theory-based—domains which can arguably adapt easier to an online teaching and learning approach.

The Changing Shape of the Physical Studio

The question at the heart of this study is whether online practices have found a permanent home as part of design studio pedagogy given the pressures of the Covid pandemic which has forced the closure of physical spaces. There has been a noticeable shift in the opinions about the role of using online tools to teach design classes. With variations across design domains, *pre-pandemic* perceptions of teaching design online indicate a marked preference for face-to-face and some blended classrooms. In a major shift based on their experience, almost half of the respondents (48%) changed their pre-pandemic view. At the crux of this data is how many design educators who favoured face-to-face teaching and learning pre-pandemic have now changed their perception about incorporating online teaching and if there are variations across design domains. Table 3 provides an overview showing these changes.

Table 3. The pandemic online opinion shift across design domains

Q: Reflecting on your experience to date, has your view of teaching design online changed?		
Design domains	**Pre-pandemic better face-to-face** % (number of educators)	**View changed based on experience** % (number of educators)
Product/Industrial Design	82% (14)	36% (5)
Fashion Design	80% (4)	-
Design Thinking/Social Design	72% (5)	60% (3)
Interior/Spatial Design	67% (4)	50% (2)
Design Research/Theory	60% (3)	33% (1)
Graphic/Communication Design	57% (17)	53% (9)
Game Design/Animation	56% (5)	20% (1)
Interaction/Interactive Design	55% (6)	83% (5)

As seen in Table 3, except for Fashion Design, there was sometimes a dramatic shift in perceptions about the incorporation of online elements into classes–even in Product/Industrial Design (a strong hands-on physical domain), 36% of respondents said they have changed their view that online elements can be part of teaching their courses.

Inquiring about the mode of teaching, design educators would favor *after* the pandemic when returning to their classrooms, 62 of the 90 design educators overwhelmingly favor a blended approach to design courses that combine online and face-to-face classroom teaching which in many cases includes classes taught in physical studios. Table 4 overviews the results for the survey participant group.

Table 4. Post-pandemic teaching mode preferences

Q: Looking forward, if you were to choose how design is taught after the crisis and in the near future, what would you prefer?	
Learning/teaching mode	**Preference for future teaching after pandemic ends** % (number of educators)
Face-to-face	28% (25)
Blended > a mix of online and face-to-face in one course/subject	69% (62)
Fully online synchronous > students and educator are online at the same time	1% (1)
Fully online asynchronous > self-paced course, students access and engage on their own schedules	2% (2)
Total	100% (90)

Checking on specific design domains, the acceptance for blended learning spans across all design domains, although some domains favor it more than others as Table 5 (below) shows. The ambivalence about teaching online is reflected in Fashion Design, where 4 out of 5 educators favored face-to-face teaching presumably because of physical studio requirements to teach the skills, but all five can envision a blended future in their domain. The teaching mode preferences shown in Table 5 give some indication that design educators view their domains differently when augmenting their teaching with online technology. This trend is seen in both small and larger sample sizes. The results in Table 5 also clearly show that a fully online teaching mode has virtually no support across design domains. In fact, only 3% (3 of 90 design educators) in Game Design/Animation (2) and Graphic/Communication Design (1) stated they would choose a fully online teaching and learning mode (synchronous or asynchronous).

Table 5. Post-pandemic teaching mode preferences across design domains

Design domains	**Blended teaching** % (number of educators)	**Fully online teaching** % (number of educators)	**f2f teaching** % (number of educators)
Product/Industrial Design	71% (12)	-	19% (5)
Fashion Design	100% (5)	-	-
Design Thinking/Social Design	57% (4)	-	43% (3)
Interior/Spatial Design	50% (3)	-	50% (3)
Design Research/Theory	80% (4)	-	20% (1)
Graphic/Communication Design	63% (19)	3% (1)	33% (10)
Game Design/Animation	56% (5)	22% (2)	22% (2)
Interaction/Interactive Design	91% (10)	-	9% (1)

Pros and Cons of Online Teaching across Design Domains: Summary of Comments

Design educators from all design domains who took part in the survey felt strongly, both pro and con, about the shift to teaching design in an online environment brought on by the pandemic. What follows is a summary of survey comments of each design domain considered by this study and their responses to translating studio pedagogy into the online environment and its potential future use.

Graphic/Communication Design (27 comments)

Graphic/Communication Design have a limited use for a traditional studio in a physical sense. The studio give-and-take collaboration and critiquing which underpins all design pedagogy, however, has not found a completely comfortable home in the digital world of this domain. Respondents in Graphic/Communication Design argue that teaching abstract skills which require one-on-one feedback in a face-to-face physical classroom struggle for a foothold in an online environment. Those missing elements include the collaborative and social interaction skills that define studio pedagogy as well as the handling of materials used in prototyping. Some design educators have commented that the quality of the student work suffers as a result of this lack of social interaction and on-the-go critiquing. However, some respondents argued that online can work in a blended approach where there are several different methods of digital

engagement that include communication and collaboration platforms such as MS Teams and Zoom that worked effectively and that they would continue to use.

Product/Industrial Design (17 comments)

Product/Industrial Design classes rely on a physical space to master technical skills using specialized equipment, which supports the idea of a studio as a workshop environment where dialogic critiquing develops creative capacity alongside mechanical skills. Among Product/Industrial Design educators, there is a consensus that these hands-on skills cannot be effectively duplicated virtually despite the availability of software programs that lay the foundation for 3D modelling and prototyping which can be useful in teaching basic concepts. One design educator said online instruction of CAD software would prove effective in blended courses.

Interaction/Interactive Design (11 comments)

The skills needed to produce products for Interaction/Interactive Design may seem to ideally translate into an online delivery because of the nature of the domain. However, the survey indicates that educators do not favor an online approach because they rely on physical labs to teach wiring and troubleshooting physical products such as controllers. Supporters of a blended approach praised the ability of online delivery to help remote students and deliver video lectures in rich web format. The benefits of integrating online elements in this domain are seen for larger class activities with one-to-many knowledge transmission.

Game Design/Animation (9 comments)

By their very nature, Game Design and Animation naturally cross the digital divide. One design educator said, “very few students need on-site teaching,” while another praised online for the management of lecture materials. However, the ‘studio’, defined in this case as a face-to-face critiquing exercise, is more effective than a remote critiquing session according to survey participants critical of online. This includes the face-to-face ability to “show-and-tell”.

Design Thinking/Social Design (7 comments)

That studio pedagogy requires participation in a physical space dominates discussions when survey respondents considered collaborative skills as a critical component of teaching Design Thinking and Social Design. The social interchange in studios is seen as fostering the development of participatory skills. However, three educators found benefits using online pedagogy in combination with ‘studio’ teaching. The online elements allowed students to source structured information on their own and students could take on more personal responsibilities to learn. The “flipped classroom” was also singled out as a positive development of using online delivery of video lectures.

Interior/Spatial Design (5 comments)

These five educators agree that not everything can be taught online because of the nature of the domain where physical spaces drive the curriculum. The consensus is that studio practice can be improved through online elements—again a blended approach, best summed up in this remark: “I now consider that some aspects of design can be better taught online through a mix of synchronous and asynchronous activities. Digital media and theory seemed to work fairly

well online and I'd be looking to keep many aspects of online delivery when we return to campus."

Fashion Design (5 comments)

All five survey respondents commented that you cannot teach everything online. Since Fashion Design is a domain that requires the hands-on manipulation of textiles and materials and the use of laser cutters, plotters, industrial sewing machines, the studio as workshop takes center stage. However, one fashion educator commented that basic demonstrations could be delivered via video. In one course students were using a 3D garment design simulation software to keep the studio type instruction alive. Another educator brought up the possibility of augmenting what is clearly a hands-on domain with a combination of digital strategies including photography.

Design Research/Theory (5 comments)

Two of the five survey participants who commented on the use of online teaching are supportive of a physical classroom. While there was one general comment that face-to-face is "always better" because students can learn from each other in an "indirect way", three other educators commented that online delivery worked well because students were more focused on their work and one of these educators also said online facilitates one-on-one coaching.

Discussion: The Post-Pandemic Design Studio across Design Domains

Although some researchers acknowledged pre-pandemic that technology is re-shaping the studio culture (e.g., Marshalsey & Sclater, 2018), there is little acknowledgement in the literature how this re-shaping will differ across different design domains. Therefore, this research focused on the spectrum of studio pedagogy in eight design domains and explored if the teaching experiences of 90 experienced design educators during the Covid pandemic changed attitudes toward teaching design online in their domain.

When analyzing survey feedback from 90 international design educators from seven countries a natural division in design domains became evident in the context of what could be taught online and what curricula still needs a physical studio/workshop space. On one side of the studio scale, in domains such as Fashion Design and Product/Industrial Design, educators are unanimous in their belief that their courses cannot fully be taught online and that a physical studio is needed to teach what are often tactile skills on bespoke equipment. But there is also a growing acceptance that domain-specific 3D modelling software, for example, can be used to teach basic concepts online asynchronously, and some demonstrations could be delivered synchronously via online communication platforms in these physical studio-centric domains. Indeed, all Fashion Design educators in this study see their teaching shifting to a blended mode after the pandemic allows returning to the classroom.

In design domains that occupy the center point of the physical studio scale, such as Design Thinking and Social Design, there is an acknowledgement that online communication and collaboration platforms are an effective addition to face-to-face classrooms; in Graphic/Communication Design, the majority of design educators support a blended approach, a middle ground in online teaching revealed for this domain in pre-pandemic research

(Fleischmann, 2020a); however, a third of these Graphic/Communication Design educators still prefer face-to-face teaching when asked their preference.

On the other end of the studio scale, in a purely theoretical domain, Design Research/Theory, which arguably lends itself to online delivery, four out of five surveyed educators confirmed that they could teach everything online during the pandemic but nevertheless reject the idea of their courses becoming fully online. This cohort also favored a blended approach with just one educator preferring face-to-face. In Game Design/Animation most surveyed educators see blended as the way forward while two educators even see a fully (asynchronous or synchronous) online future while another would choose face-to-face.

This study reveals that when moving their design studio classes online, design educators across design domains had different experiences based on their particular studio pedagogies and ways they teach in their domain supporting Jones, Lotz and Holden (2020). This raises important pedagogical questions about how design is taught in a post pandemic future and findings from this study confirm existing research (Fleischmann, 2019): not one type of online approach fits all design domains when moving forward post pandemic.

However, there has been a strong shift in acceptance of online elements in the design studio across all design domains accelerated by the pandemic, which reflects in 62 of 90 design educators (69%) agreeing they would choose a blended teaching approach on return to the physical classroom. What this study shows is that design educators have not just overcome their long held belief that design education cannot be taught online but they have learned through trial–and-error which online elements would work as enhancements to their physical studio classes.

This adaptation of online elements is a remarkable shift for design education, traditionally grounded in what is defined as studio teaching pedagogy which is inextricably linked to a physical studio space, hands-on learning-by doing, real time feedback and interaction in this space (e.g., Crowther, 2013; Shreeve, 2011). Pre-pandemic, 63% of survey participants selected face-to-face as the preferred choice of teaching. After their experiences of online teaching during the pandemic, there is now an understanding among these design educators that the way design is taught and learned does not automatically exclude online teaching. Furthermore, survey participants have not only identified ‘that’ online elements can help enhance the physical design studio learning experience but also ‘where’ and ‘how’ the physical studio can be ‘blended’. The number of design educators who would select face-to-face teaching in post-pandemic classrooms dropped to 27%. Surprisingly, no specific design domain stands out for this face-to-face preference.

Different blended teaching approaches across design domains were mentioned by survey participants. For some educators a flipped classroom model, where asynchronous video lectures are made available online, would be a valuable addition to face-to-face teaching. Existing research into flipped classrooms highlights advantages but also challenges as trialed in various design domains, e.g. Fashion Design (Yick et al., 2019); Communication/Graphic Design (Fleischmann, 2020b). More research on the effectiveness of flipped classrooms and other online strategies in design education and across design domains needs to be undertaken.

Dreamson's assertion (2020 p. 495) that physical studio activities that cannot be replicated in the online environment will "not stop digitizing design education" is supported by these findings. But his vision that "online design education is…an emergent design studio" does not yet find a firm foundation among design educators polled in this survey. The results of this study clearly show there is virtually no support for fully online classes in design education regardless of design domain– whether it is asynchronous or synchronous–confirming pre-pandemic findings (Fleischmann, 2015; Park, 2011; Wood, 2018). This is somewhat surprising given that various institutions have been running online design education programs for several years (e.g., Jones, Lotz & Holden, 2020; Watson, McIntyre & McArthur, 2009). Only 3 out of 90 design educators (3%) see their course being taught fully online after the pandemic. Notably, there is a hesitation to continue with a synchronous online approach to teaching design (which basically models what was done during the pandemic).

The clear hesitancy of design educators to fully endorse the online studio is based on numerous comments focusing on the difficulty of replicating the social aspect of the design studio online. As outlined, learning through peer and peer/educator interactions, by chance encounters and ad hoc hands-on experimentation is often seen as the crux of the design education experience. Despite the rapid application of communication/collaboration platforms during the pandemic, some survey participants were uncomfortable with the digital feedback mechanisms of these platforms which educators wrote created a higher workload and longer preparation time, comments which should be investigated further.

Conclusion

The Covid-19 pandemic abruptly transitioned design classes from face-to-face teaching to online teaching, upending long-held beliefs that online design teaching and learning is basically anathema to design pedagogy. The pandemic has prompted a significant shift to the acceptance of a blended approach to studio pedagogy, even in design domains that are teaching tactile skills on bespoke equipment. Design educators are essentially still in a trial-and-error phase of discovering and incorporating online tools; comments from the majority of the 90 international design educators, even those with no online teaching experience prior the pandemic, indicate a willingness to incorporate online elements to augment studio teaching in the future, initially by necessity but increasingly by choice. The majority of design educators in this study have now experienced that online elements can enhance the physical teaching and learning experience.

This study has also demonstrated that a nuanced approach to analyze how design domains differ in their adoption of online studio pedagogy can help better define strategies to re-shape the future design studio. Highly experienced international design educators from the design domains Product/Industrial, Fashion, Graphic/Communication, Interior/Spatial, Game/Animation, Interactive/Interaction, Design Thinking/Social Design, Design Research/Theory have identified different ways how online elements could potentially enhance their physical studio teaching practice. This study shows that online studio experiences differ across design domains and we will see different innovative ways online elements will be incorporated in the future across design domains.

Challenges remain, particularly in the creation of the social dimensions of the physical studio in a fully online environment. Social interactions, a hallmark of studio pedagogy, can take place in a collaborative way online, although not to the satisfaction of many design educators who participated in this study. The virtual 'making' experience has been trialled but has not found a firm foothold among design educators who teach hands-on skill development and rely on the 'see-feel-touch' component in their design domains.

Still, the Covid pandemic has opened the door to online studio work that had previously been rejected as not useful to adapt to physical studio requirements. As this study confirms, we will see more blended study options in design education. In all probability, there will be increasing pressure to also offer fully online programs. This will be driven on one side by a demand from students for more flexible study options as well as institutional financial pressures brought on by the pandemic to save design programs experiencing dwindling international student enrolments. As argued in the introduction, it is unhelpful to generalize across design domains and institutions need to align potential plans of moving design programs into an online future with existing and emerging research findings relevant to each design domain. Domains such as Graphic/Communication Design will likely lead the shift to online delivery because they are less reliant on a physical studio space and online programs in these domains already exist. Other design domains such as Product/Industrial or Fashion Design currently face the practicalities of providing student access to machinery and therefore do not lend themselves to be delivered fully online. However, that may change as technology evolves.

The ongoing physical and financial stresses of the Covid-19 pandemic have sparked a much needed self-reflection among design educators about what the design studio really means in a digitally focused pandemic world. While educators differ in their interpretation/applications of what the design studio is, the survey shows an agreement across all design domains that the traditional design studio is not dead but is undergoing a fundamental transformation. The Covid pandemic has been a catalyst for change in design education by re-shaping attitudes toward a greater acceptance of online teaching to augment the physical studio. For the majority of design educators, these digital transformations will be driven by more purposeful blending of face-to-face and online teaching that will evolve differently across design domains.

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The Ones Who Have Never Been Physically in a Studio: Myths and Hacks of First Year Basic Design Students in the Pandemic

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Abstract
Design and architecture students who have started university in 2020, unlike the students before, attended virtual studios without experiencing the physical studio environment. The vast majority of them attended classes from their rooms or living rooms of their homes in different cities and tried to meet the requirements of the courses. Their computer screen turns into their eyes and its speakers turn into their ears. They had no other experience to compare this with, yet they have lived a studio environment, juries and more, even though they are virtual. This research focuses on their experiences with an emergency remote teaching basic design studio and their expectations of a design studio environment. By making short, semi-structured interviews with first year architecture students (n=14), this study explores how pandemic experience of 2020 might affect the basic design studio environments of the future. As a result of the study, two themes emerged based on the analysis of the data. The first, called the myths of the studio, reveals the expectations of the students about the design studios and how they try to realize these expectations virtually. The second theme, defined as hacking the studio, emphases how these students perform some actions that they cannot do in a physical studio environment by using the technologies they have.

Keywords
design studio, virtual design studio, basic design studio, emergency remote teaching, COVID-19 pandemic

Introduction
Along with many other changes affecting many fields all around the world, the global COVID-19 pandemic forced most universities to move their design studios into a virtual space. Started in 2020, in the middle of the 2019-2020 Spring semester, the students who began to attend the virtual studio had already experienced a physical studio before. With the continuation of the pandemic, at the beginning of the 2020-2021 Fall semester, new students enrolled in universities, and they become the first students who experienced a virtual studio before experiencing a physical one. The first-year design/architecture students of the 2020-2021 academic year have nothing but expectations on the studio education.

The vast majority of these students attended classes from their rooms or living rooms of their homes in different cities and tried to meet the requirements. Most of them never met their classmates or lecturers face-to-face, had never been on the university campus, or never been in the city which their university is in. Their computer screen turned into their eyes

and its speakers turned into their ears. Their internet speed became an important issue, while they were trying to communicate with their lecturers and peers. They had no other experience to compare this with, yet they have lived a studio environment, juries and more, even though they are virtual.

This paper presents a basic design studio from the 2020-2021 Fall Semester as a case study aiming to reflect the student's point of view, to determine their online basic design studio experiences in pandemic and to give design educators an idea about what can be done in the future in such emergency situations.

Background of the Study

Design studio has been seen as not only a "physical space", but also a "unique pedagogic method" in design education (Broadfoot and Bennet, 2003). Since it is seen as the "backbone" of architecture and design education, studio has always had a primary position in design teaching, mostly being a *taboo, undebatable* and *untouchable* (Salama and Wilkinson, 2007, p. 3). Schön (1985, p.31) formulates the design studio as a process of "reflection-in-action", emphasizing that studio learning is based on "practice and critical reflection on practice". Thus, "learning-by-doing", Schön states, is the main pedagogy of studio education. In studio, moreover, students and their tutors are in a continuous dialog, which Schön calls as "reciprocal reflection-in-action", in which tutors convey their tacit knowledge to students by drawing and talking: the actions consisting of together the "language of design" (Schön, 1985, p. 31). Also, students not only learn from their tutors, in studio setting, but also from their peers by observing each other's work (Kvan, 2001). In this way, studio is an "active site where students engage intellectually and socially", being a "social practice" rather than mere knowledge-based education (Dutton, 1987, p. 16). With this socio-spatial character of the studio, students gain the ability of communication, criticizing and collaboration with others about their works (Gross and Do, 1997), which are very crucial parts of peer learning (Kvan, 2001).

Considering these essential socio-spatial features of the studio rooted at the centre of design education, moving this traditional model to the virtual platform can be found confusing at first sight for ones who are unaccustomed to this idea. However, virtual design studios (VDSs) have been the active part of design education and discussed in various perspectives for more than two decades (Wojtowicz, 1995; Maher et al., 2000; Kvan, 2001). From this perspective, new studio approaches adopting digital modes of learning and integrating them with conventional ways has created significant learning and teaching models (Pektaş, 2015; Rodriguez et al., 2018; Jones et al., 2020).

While in the early years the issues regarding VDS were about the technological capabilities of those times (Kvan, 2001), today these concerns moved to how emerging tools and mediums can be effectively utilized for better learning experiences (Iranmanesh and Onur, 2021). In this respect, Broadfoot and Bennet (2003, p.4) emphasize:

> *"Just as the traditional design studio is arguably unique as a form of educational delivery compared to many other disciplines, the online studio also needs to be structured differently to other courses offered online by institutions around the world."*

The most vital point for this differentiation, according to Broadfoot and Bennet (2003, p.4), is to create a “community rather than isolated, one-on-one communication” in VDS. Providing continuous, effective, and collaborative communication not only between students and tutors, but also between students themselves, therefore, has a crucial role in VDS pedagogy (Kvan, 2001; Broadfoot and Bennet, 2003). Since in virtual medium students may feel like losing their identities, sense of belonging and being a part of a community due to physical distance (Saghafi et al., 2012), creating “sense of place” can be helpful for the development of a community atmosphere and the establishment of students' identities in that community (Maher and Simoff, 1999). Also, helping students to visualize their online presence such as using avatars and encouraging them to acknowledge the presence of each other may improve their sense of place, and in this way their sense of identity, creating a collaborative learning environment (Clark and Maher, 2005).

While lack of physical interaction in VDS and its likely impacts on students mentioned above may bring some questions regarding peer learning, social engagement, and motivation (Saghafi et al., 2012), Pektaş (2015, p.263) states that it provides many opportunities for students to interact not only socially but also culturally with their peers, expanding the spatio-temporal limits of physical studio. Pektaş (2015, p.263) indicates that adopting various digital tools having various affordances in VDS has a significant potential to enhance the dialogic, social, and participatory nature of studio education, supporting effective learning processes. Furthermore, enriching studio education by new technologies, especially use of social network sites, creates an appropriate environment for “collective intelligence”, rather than an approach based on individual development (Ham and Schnabel, 2011, p. 115). With this collective, collaborative, and cultural learning structure provided by VDS, students may have a great chance to improve their perspectives and to reach a more diverse body of knowledge (Sagun et al., 2001). Additionally, since it changes the dynamics of relationships between tutor and student (Kvan, 2001), VDS provides an environment in which students more actively participate (Sagun et al., 2001).

In this respect, a powerful social mode of learning is very possible (Schnabel and Ham 2012; Sidawi 2012; Jones et al., 2020); however, creating a successful learning environment for students requires a highly careful consideration of the ways in which studio experience is designed (Jones et al., 2020). Creating a learning atmosphere encouraging students for viewing each other’s works, learning from others’ experiences by using social comparison, and in this way developing their social presence in virtual medium contributes to active engagement of students in the further stages of the process, leading to the emergence of “communities of practice” (Jones et al., 2020).

Besides, emergency remote teaching (ERT), which is also a helpful term in defining the case study presented in this paper, can be considered as another significant perspective of this study along with the others mentioned so far. Hodges et al. (2020) defined ERT as a temporary shift of education to an alternate mode due to crisis circumstances and stated that ERT involves the use of fully remote teaching solutions for education that would otherwise be delivered face-to-face, blended or hybrid and once the crisis or emergency has abated that will return to that format. In these emergency circumstances rather than trying to create a robust educational ecosystem, the main objective was stated as to provide temporary access to instruction and

instructional supports in a manner that is quick to set up and is reliably available (Hodges at al., 2020). Furthermore, Yazicioglu Halu and Kula Say (2021) listed the needs that must be met in case of emergency use of distance education in architectural education and have emphasized that the most important elements as; students to feel the studio environment in digital environment and to share jointly, as well as quickly converting their productions into digital data and documenting them.

Within this theoretical frame, the present study aims to bring a different perspective to the virtual design studio education. As explained throughout this background section, there are many successful studies examining the experience of students not only in VDS but also in ERT. While only a few studies (Jones et al., 2020; Iranmanesh and Onur 2021) consider the VDS experience of first year students, they are mostly based on the "tutor's point of view". For this reason, as far as we can observe, the students' point of view to the concept of studio either online or physical, particularly of ones who have never been in the "real" physical studio before, has not been studied much yet. In this respect, this paper will demonstrate the findings of this study from the "first encounter" of the first-year architecture students with the studio concept.

Case Study

The Basic Design Studio Course which is the case of this paper was conducted at a recently founded architecture faculty in one of the major universities in Turkey in the fall semester of 2020-2021. Course duration was 4 hours a week over a total of 14 weeks. 67 architecture freshmen enrolled in the class, and the course was held so that all these students were in one online class at a time. A lecturer from the Industrial Design Department and 3 teaching assistants from the Architecture Department gave the course via Zoom platform.

All of the lectures (4 hours for 14 weeks) were recorded, and students had access to these recordings during the semester. The attendance of the students to the course was not documented in any attendance list. Students were free to open or close their cameras during the course.

Students completed 4 design projects and a final portfolio submission during the semester. All these projects have a submission each week, generally on the day of the course or sometimes the day after. None of these were team projects, because the instructors supposed that it would be very difficult for them to work as teams, as they thought that these students had never met before and would not meet face-to-face during the lesson.

All weekly or project submissions were done via Google Classroom with the photos or videos of the exercises or with the visual presentations of projects. At the end of each project, there was a jury session, where the lecturer and all the teaching assistants were the members of the jury. Due to time concerns, other jury members could not be invited to semester juries, but a jury member from the Department of Architecture was invited to the final jury. During these jury sessions, Google Jamboard was used for presenting the works of the students and these Jamboards were open to all the students during the semester.

The course program was rigorously clear, students having the design brief and documents of each project a week before the start. Content and materials of each week was written in the design brief. Students were informed about the evaluation criteria in detail. Students got 1 point (out of 100) from their weekly submissions, where project submissions were 10 points each. No criteria were applied while evaluating the weekly submissions: Each student who made a proper submission on time, got 1 full point. For project submissions, evaluation criteria were content, originality, workmanship and time planning.

Other than the online class which was synchronous, students and the lecturer communicated asynchronously via email and Google Classroom. At the end of each project, the lecturer shared the selected works of the students via her personal Instagram account, to create continuous communication and to say "*still here*" as described by Kvan (2001, p.349).

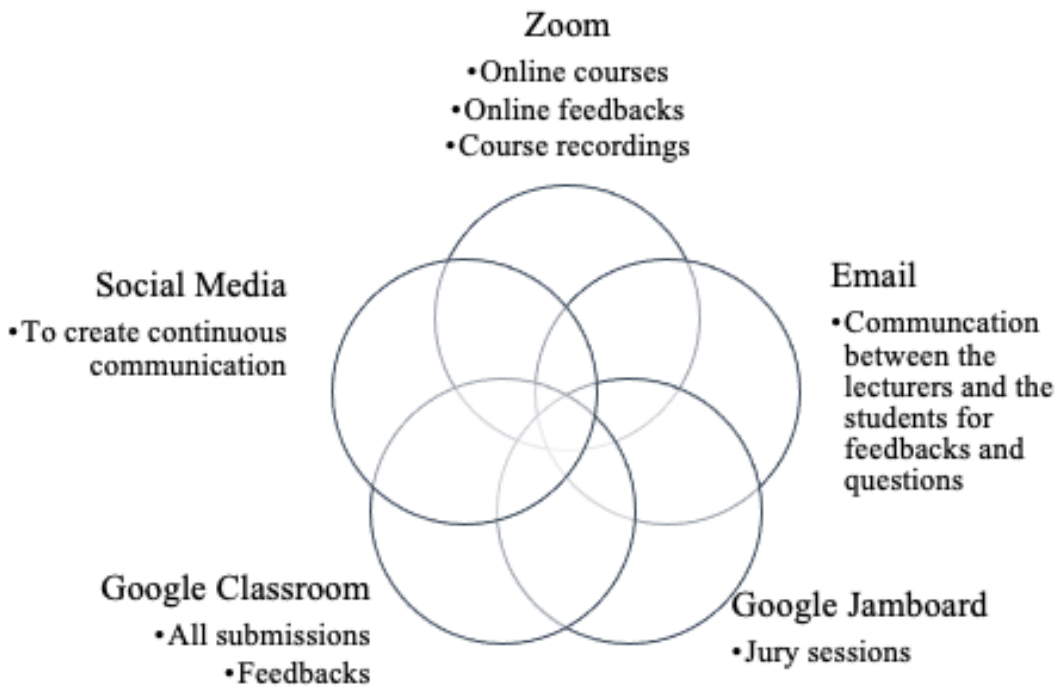

Figure 1. Online platforms used during the Basic Design Studio Course

Among all students who were enrolled in the basic design studio course, 14 of them voluntarily participated in this research study. Research took place approximately two months after the finals of the course. Semi-structured interviews were carried out by the lecturer (the first author of this paper) via Zoom meetings, each meeting took around 15 minutes and meetings were recorded. Although the focus was on the basic design studio during the interviews, it was aimed to explore the design studios as a whole. Open-ended questions about architectural education and studios courses were asked. The questions asked were (although not always asked in this order):

- What is a “design studio”, what should be in the “studio”?

- What were your expectations about architectural education and studio courses when coming to the faculty of architecture? Then what was your experience during online studio education?
- What were the essential elements of a virtual basic design studio course?
- Have you had experiences such as “peer-learning” and “learning-by-doing” during basic design studio course? If you have had these experiences, how?

Interview data was transcribed and analysed separately by two of the authors using grounded theory techniques described by Strauss and Corbin (1998, p. 12). Strauss and Corbin (1998, p. 5) stated that analysis is an "interaction between researchers and data", that they are procedures that will help to standardize and provide accuracy to the analysis, but these procedures should not be followed strictly and should be used creatively and flexibly by researchers.

First, interview data was open coded. While working with the expressions used by the students, general thought patterns, repetition of certain statements, and content that dominated the explanations was coded. Secondly, axial coding was done to link categories together into a broader framework. At this stage coding occurred around the axis of a category, linking categories at the level of properties and dimensions (Strauss & Corbin, 1998). For example, codes related to the students’ expectations from a basic design studio were linked and categorized under “The expectations from a design studio and ways to realize these expectations”. The analysis continued with selective coding to link the codes created to a wider framework. With selective coding, categories were integrated and refined to themes. For example, it emerged from the axial coding that students hack some of features of a physical basic design studio, by using technological tools. Consequently, the theme named “hacking the studio” was formed and all related categories and subcategories were organized around this central explanatory theme.

Table 1. Coding process

<table>
<tr><th>Open coding</th><th>Axial coding</th><th>Selective coding</th></tr>
<tr><td>Design studio is: working, creating, interacting all together around “big tables”</td><td rowspan="3">The expectations from a design studio and/or ways to realize these expectations</td><td rowspan="3">The myths about the studio</td></tr>
<tr><td>Basic Design Studio is: a must-attend course</td></tr>
<tr><td>Discord is: a place to work, create, interact</td></tr>
<tr><td>Virtual design studios are: difficult that physical ones</td><td>The expectations from a virtual design studio</td></tr>
<tr><td>Presenting 3D physical models of their projects with 2D visuals</td><td>Creating illusions of projects and the student herself/himself</td><td>Hacking the studio</td></tr>
</table>

Being able to close cameras, during the class and the jury sessions		
Having unlimited access to all documents, recordings and Jamboards all the time	Using the properties of technological tools to change the features of the design studio	
Getting feedback from the lecturer privately		

Results

Based on the analysis of the data, two themes emerged from the Selective coding: the myth of the studio and hacking the studio. What these students, who started their higher education in the 2020-2021 Fall Semester, were thinking about studio courses before starting their education and how they tried to turn some of these myths to reality, were defined as the myth of the studio. Furthermore, from the analysis of the interviews, it can be said that these students hacked the studio, by making some actions that they could not be able to make in a physical studio environment by using the technologies that they have.

The Myth of the Studio

Almost all the students described the studio as a space made up of people gathering around "big tables" when asked how they imagined the studio as a physical place. For these students, the most important feature of a “studio” is people, working, creating, interacting all together around big tables. One student mentioned that the studio is a place where everyone meets and talks with each other and in it, there are crowded friend groups. She added that even during the pandemic, studio education forced them to meet each other somehow. Another student defined the studio as a place that will be enough even if it has just the ground and said that inside a studio there may not be a table, a chair or nothing. She added that for her, the studio is a place where creative people work. A student mentioned imagining the studio as a laboratory where the works of their predecessors and the works of her own class will be displayed together. Others mentioned that in a physical studio, they imagine a lecturer in the middle of everything; teaching, commenting, interacting with the students equally. A student stated that she was thinking that studio was “an environment where there is information flowing around all the time, a place where that information can be felt without knowing it” before the start of the semester.

Two things helped these students to turn the “big table” myth into reality. First, due to weekly submissions on the same day of the basic design course, these students indicated the feeling that they must attend the basic design studio classes in real time, even if they do not feel obligated to do so with other courses. One student mentioned that since it was a studio lesson, there was no chance to close the computer and go away, they felt that they had to listen and do their project at that moment. She detailed that they knew that the more questions they asked during the lesson, the less their work would be later and the better they evaluated the lesson, the easier it was for their project to progress. Another student said:

> *"If we didn't do it in class, we wouldn't be able to, because sometimes we got to a point where we didn't even understand what to do, but we somehow did. There were projects that we finished without understanding anything, then when we look back, we understood. That's why it could be very challenging when you didn't do it in class."*

Another reason for attending the online courses might be the students perceiving studio lessons as a place where creative people work. By attending classes on time and trying to create during class hours, they felt like they were interacting and working around a virtual "big table". One student stated that ideas are created in the lesson when students and lecturers talk all together, so she indicated that it is much better for them to start working in the virtual class. Another one declared that:

> *"Frankly, in the morning classes if we couldn't do anything together, we were mostly sleeping, because we were studying late at night."*

Secondly, most of these students mentioned using "Discord", a digital communication platform designed for gamer communities. Students use this platform to create a virtual student community, with rooms named such as "studio", "library", "canteen" and they meet on this platform to study, to create and to chat. Moreover, they mentioned using WhatsApp group chats for continuous communication with their peers. A student explained their use of discord as:

> *"When someone is bored when she/he can't do their homework, she/he join our discord channel, and we help her/him. There, we do our homework together. I usually have discord open. If we are on the computer, a notification comes, informing that someone has entered the room, tagging us, saying "I need your help guys", so we help each other in that way."*

Although this consequence occurs regardless of the progression of the course, the use of these virtual communication platforms affected peer learning in a positive way and helped these students to realize the "big table" myth in the conditions of the Covid-19 pandemic.

Another myth was that virtual design studios would be inefficient and more difficult than physical ones. Students stated that, when they learned that the classes will be online before the start of the semester, they thought they would have a hard time especially in the studio courses. But in the case of basic design studio, even if it was virtual, they stated that the lesson was efficient and understandable, contrary to what they expected. A student stated this as:

> *"Even though it's virtual, it worked just as I have imagined it."*

One of the reasons for this was identified by a student as being able to easily communicate with the lecturer via email and the lecturer's quick response. Another student stated that:

> *"Communication is essential for virtual education. It would be very difficult, especially if we could not get a response from the lecturers via email."*

Some other students stated that being able to watch the lecture recordings over and over helped them to understand the points that are not clearly understood in the lesson, and this would not be possible in the physical design studio. A student stated that when she missed the studio lessons, it is not enough for her friends to explain it, and it is beneficial for them to have the chance to listen to the lesson again.

Moreover, students indicated that having a strict programme of the contents and the materials of the projects in the basic design course increased the efficiency of the course. One student specified that planned lessons made the knowledge permanent. Another one acknowledged that:

> *"I think that it is very helpful that the program of the lecture was ready in advance and shared with the student. I was preparing the materials I was going to buy; I was trying to read and understand beforehand."*

Another student stated that he usually had difficulty in doing the projects in the first hours of the lesson, but he started to do better in the following hours, and if they were in the physical design studio, not doing it at first would cause him to lose his self-confidence.

Hacking the Studio

Analysis of the interviews showed that some of the features of the physical studio classes were hacked by these students using the properties of the technological tools.

First of these hacks were done by the students who wanted to get feedback from the lecturer privately. Being generally not possible in a physical studio, students sent their works to the lecturer privately using the chat feature of Zoom platform during the class. Likewise, some of the students prefer to engage in critique via email, confidentially. Private interactions between the students and the lecturer affected peer-to-peer learning. One of them mentioned that after a while, her classmates started to send their works privately via Zoom chat, and there is nothing left for her to refer to. Another student detailed that *"they were not started as peers but rivals",* because of not having face-to-face interaction, and that getting private feedback is a result of that. Another one stated becoming demoralized by seeing the works of the students who *"turned feedback process into a show"* by sending successful works during the lesson. This student added that she could only see her own work and what was shared on the computer screen in a virtual studio. Stating that if they were in a physical studio, there would be 70 people like her, and she could see who couldn't do anything as well as who could do well. Jones et al. (2020, p.20) stated that asking for feedback in an online studio causes the student to associate both their work and their online presence with an urgent call for help and added that announcing to other students that she/he "needs help" is not same as asking for constructive feedback in a physical studio.

Another way of hacking the studio is students being able to create "illusions". They were required to make 3D physical models of their projects but expected to present them with 2D visuals. This phenomenon created an illusion of reality, sometimes making unsuccessful 3D models with better presented visuals, successful. Lecturers have no chance to touch the models, they could only see the illusions. A student stated that since they've always shared

their projects with videos or photography, when she went to her friend's house and saw her real work, she understood that it was much different than its photo. Besides, a student stated that he initially thought that uploading the photos of his projects to Google Classroom would be just like a voucher of his work, but later understood that his projects would be evaluated with those visuals. Another student said that what they did was wasted *"without even touching anyone's hands".* At the end, their work which will be evaluated is not the work itself anymore, but just the visual representation of it.

Another hack done by the students and available via technology was being able to turn off cameras, during not only the online classes but also during the jury sessions. This hack created another illusion, but this time the illusion of the student herself/himself. As mentioned before, design studio has a socio-spatial character and there was a concern that this might be damaged in virtual platforms. Design studio is also a collaborative structure that requires interaction. In virtual platforms, students made themselves invisible by turning off their cameras, and in this way, they hacked the social, spatial, and collaborative structure of the design studio with their invisibility. In their "illusional presences", the design studio has started to become different from its previous versions: providing students a platform of collaboration and interaction in the absence, at least visually, which is why it was defined as a "hack" in this study.

A final hack that was done by students was having access to all student projects, recordings of online classes and Jamboards throughout the semester. In a physical studio, students usually have limited access to other students' work and previous weeks' classes. However, by the help of not only the technological platforms, but also the decisions of the university and the lecturers, students of this online basic design studio hacked the limits of access. They stated that they looked at the images uploaded to Classroom and Jamboard over and over before and after the juries, even after the term ended, that they examined what was right and what was wrong and indicated that this was very effective in their learning process. As Pektaş (2015, p.263) identified, one advantage of the virtual design studios is the openness of the process. Pektaş stated that the reason for this is that the design processes and student documents are shared temporarily in the traditional design studio, while as a result of the tools in the online studio, these were open to sharing in a way that allows students to observe the processes of other students and become more aware of the project needs.

Discussion

This study showed that without experiencing a physical design studio, students hack some properties of it and have factual myths about it which they tried to realize with the resources that they have. They imagine the studio as a social place. Many studies showed that developing social bonds among participants is an important part of developing a successful VDS. Jones et al. (2020, p.21) stated that having large proportions of students who are completely new to studio environment negatively affected the forming of the necessary habits from listening-in, social comparison and the development of community of practice. Iranmamesh and Onur (2021, p.259) identified that class discussions showed a similar trend to the tutor–student communication for 1st and 2nd year students, but the item targeting peer learning showed the lowest score. Kvan (2001, p. 351) quoted Vaitkus, pointing out that if there is anonymity, effective groups cannot be formed, that effective trust-based relationships cannot be established when members do not know each other, and thus peer learning is difficult when

the group is not established. Based on the findings of the present study, it can be stated that to help the students in a virtual basic design studio, the projects might not only focus solely on the content but also designing creative connections between students, between the students and the lecturers and between the students and the rest of the world. They need virtual social spaces.

How will studio hacks affect the future design studios? The nature of the virtual studio makes the student a kind of illusionist of his/her reality, being able to perform tricks that deceive the eye. Moreover, it affected the role of the instructor, in some cases making her/him another kind of illusionist. As Kvan (2001, p.353) stated, VDS changes the relationship not only between lecturer and student but also between student and the rest of the world. The technological tools used are a part of this illusion, setting the boundaries of interacting, sharing and in some cases producing and working. As Sagun et al. (2001) have stated, it is a fact that online education enables students to become aware of their control over human education by giving them some responsibilities and roles and they may experience problems they may encounter in the future and be ready for professional life. Moreover, as Sagun et al. (2001, p.334) mentioned, the power of the current technologies to store, index, search, transform and distribute information asynchronously can be adopted to improve the quality of hybrid studio classes. The process of virtual studios prepares these students to a future where they can make projects that in the absence of themselves, have the power of speaking for them.

It is important to state that this virtual basic design studio was done during Covid-19 pandemic where there are strict curfew restrictions. The Government of Turkey announced restrictions due to Covid-19 pandemic and one of these restrictions that affected these students most was curfews for individuals aged 20 and below during the hours of 13:00-16:00. Moreover, some of the students or their relatives tested positive for Covid-19 and received treatment during the semester of the basic design course presented in this paper. One student stated that she started to feel like a mouse in a cage because of the restrictions during the same period, and after a while the fun of creating new projects started to disappear. Another defined that she sometimes experienced the “feeling of being inside a simulation”. Therefore, it is necessary to note that there are important psychological issues that distinguish virtual design studios built during emergency situations from other virtual design studios. These studios are mostly the studios of the crisis period without full-designed tools and infrastructure.

Based on the findings of this study, it can be said that providing students unlimited access to all documents, student projects and feedbacks in the future will make positive contributions to both physical and virtual basic design studios. Moreover, creating an open online platform for feedbacks might help students get feedback without becoming rivals of each other, and to come back from time to time to look at the feedbacks. It should also be noted that all these might accustom students to having everything at their fingertips without effort.

One of the challenges of virtual design studios were students presenting an illusion of their projects. By using the Minecraft game creatively in his basic design course, Acar (2021) enabled students to create projects in a virtual environment and resulted with the virtual presentation of the project itself, not an illusion of a physical project. However, in this case the project itself was an illusion and students moved away from the physical world, turned into avatars in a

virtual world. To deal with this dilemma, lecturers need to ingeniously design the course to adapt to this new situation.

Table 3. Recommendations for future basic design studios

The myths of the studio		Hacking the studio	
Create a "big table" for working, creating, interacting all together		Presenting the project itself, not an illusion of it	Provide unlimited access to all documents, student projects and feedbacks
Design creative connections	Create virtual social spaces	Design creative projects	Create open-platforms

After all the experiences, it is a fact that design education will be different after the Covid-19 pandemic. Previous studies stated that students prefer a hybrid studio, rather than having solely a virtual or physical one; a studio in between, having the advantages of both, which is more efficient and related to the real world (Saghafi et al. 2012; Pektaş, 2015; Rodriguez, 2018; Iranmanesh & Onur, 2021). Consequently, instead of trying to draw a clear line between the virtual and physical worlds and compare the two, as design educators we should focus on building these hybrid studios, effectively.

Acknowledgements

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Ethics and Privacy Statement

To conduct the study, necessary written permissions were obtained from Istanbul University, Faculty of Architecture. All data collected and the identities of participants are strictly confidential. Unique identification numbers were assigned to all participants that were used throughout the data analysis process and reporting. During interviews it was outlined to the research participants how confidentiality and anonymity will be achieved and a verbal consent was taken before the interviews.

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26.4

Everyday Routines and Material Practices in the Design Studio: Why Informal Pedagogy Matters

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Abstract
This study aims to improve understanding of the design studio as a setting where formal and informal pedagogies intersect. We argue that the informal dimension of learning has an essential but under-acknowledged role in contributing to the development of design students. Our research focuses on students' everyday routines and their associated material practices in both a proximate studio setting (physical), – such as making tea, speaking to peers, doing work – and in a distance (online) setting. We frame these activities as *informal pedagogy* that supports design learning and the development of designerly identities. While this study focuses on students' accounts of their everyday use of the physical studio (pre-pandemic), it is augmented with students' accounts of distance design education (during the pandemic). The disruption to studio practices, and the subsequent use of alternative environments to learn design, provided an opportunity to reconsider everyday routines and material practices at both proximate and distance settings. Supported by the infrastructure of the physical studio, we identify five 'functions' of informal pedagogy and use this to observe how these functions operated in distance settings. To understand the intersection between formal and informal pedagogy, we argue that binary terms are unhelpful and instead argue for an axis that runs from formal to structured informal to unstructured informal to social.

Keywords
design studio, design education, informal pedagogy, formal pedagogy, distance education, social learning

Introduction
This study presents the studio as a setting where formal and informal pedagogies intersect. We explore this intersection in the physical studio (before the pandemic) and during a year of pandemic displacement to understand the role of students' everyday studio routines and to discuss the implications for design education.

The Design Studio
The design studio takes many forms and encompasses a wide range of methods, environments and patterns of interaction across a range of disciplines and institutions (Cennamo, 2016). While this suggests the studio is a mutable entity, the literature consistently points to studio conversations – between tutors and students – as the primary means through which learning is promoted (Logan, 2006).

Studio conversations represent the cornerstone of formal pedagogy, and while they can happen in different ways, two modes dominate. First, the desk crit, a conversation between a single tutor and student emphasising support and being non-judgemental (Shaffer, 2007).

Second, the critique, which often occurs in groups, is led by tutors and emphasises articulating decisions and making judgements. The desk crit and the critique are the most visible aspects of studio education and have typically attracted the most attention. They are also components of a broader studio system.

Shaffer's (2007, p.116) study of an architectural studio describes a coherent system composed of 'cycles of production and reflection'. Production refers to the design work (driven by a project), and reflection (prompted by feedback) leads to further iterations of design work. The cycles of production and reflection (See Figure 1) work at various scales; larger cycles are augmented by smaller, less formal non-judgmental ones that take the form of desk crits and are designed to encourage further reflection and iteration. These cycles remind students that work is never complete and 'always on a pathway toward better iterations' (Brocato, 2009, p.42). These cycles support learning to design, but they also undertake a parallel function: for students to learn to think and act like designers. As Shaffer (2007, p.21) notes, "students were not merely solving problems; they were engaged in an iterative process of expressing—and thus shaping—their identities."

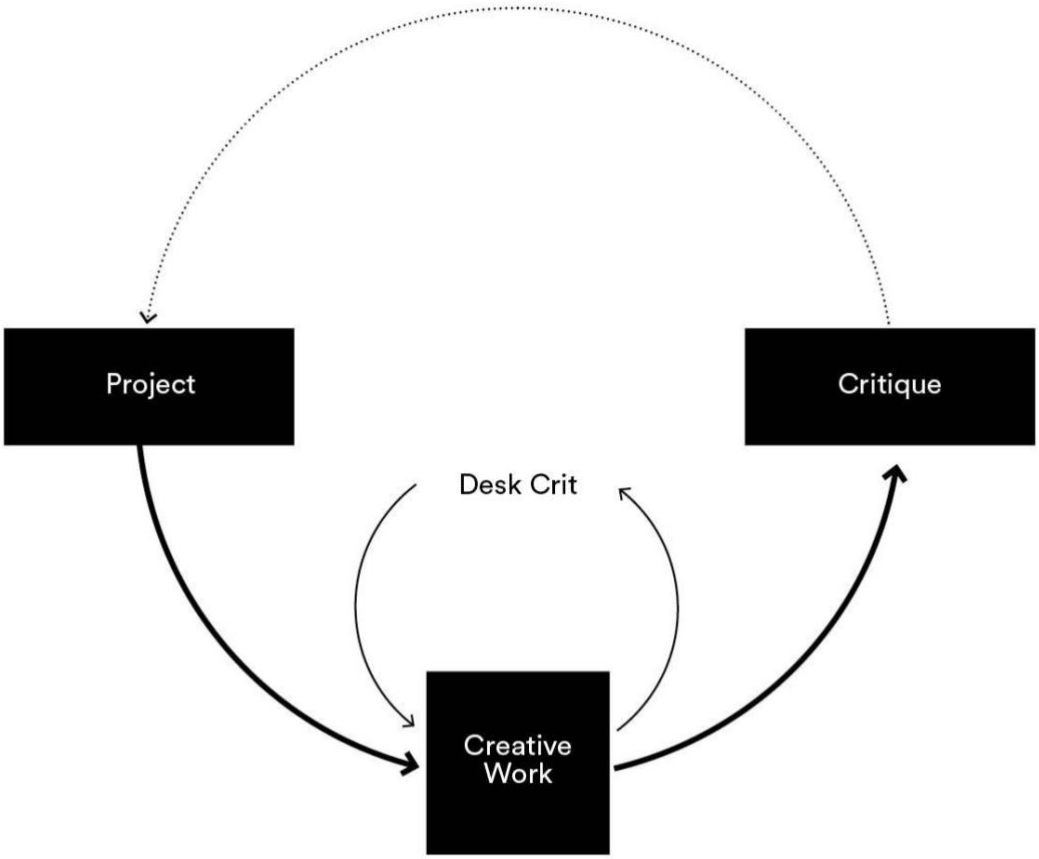

Figure 1. Cycles of Production and Reflection (adapted from Shaffer 2007)

Formal and Informal

Much of the research on the conversations in studio environments between tutors and students (Schön, 1987; Dannels, 2005; Shaffer, 2007; Cennamo & Brandt, 2012) positions discourse as the primary means through which students learn to design and think like a professional designer. Design knowledge is developed through the experience of doing (Schön, 1983) and supported by the right kind of telling (Cennamo & Brandt, 2012). Composed of crits, desk crits, briefing, workshops, seminars, these scheduled and serendipitous encounters between tutors and students constitute the formal pedagogy of the studio.

We turn our attention to the time spent undertaking design work outside of formal interactions. We understand these activities as students' everyday routines and material practices – the low hum of activity and inactivity: students working at laptops, talking, moving around to see what is going on, making tea, looking, reading, laughing, cutting out, folding. Notably, researchers have given less attention to this aspect of studio life despite occupying most design students' time.

We argue these seemingly mundane activities have an essential role in learning to design. Although largely ignored in the literature on proximate settings, they also require closer attention at distance settings. Therefore, as Gray and Howard (2014) state, to develop a better understanding of the whole student experience we should consider what is usually out of view (for example informal pedagogy) a significant part of learning design and becoming a designer.

Our research examines students' accounts of everyday studio practices to explore how informal pedagogy intersects with formal pedagogy. We are interested in the role of the physical studio in supporting informal pedagogy and its instantiation in distance settings. To address these aims, we created three research questions:

1. What are the everyday routines and material practices of both proximate and distance studio settings?
2. How do these everyday routines and material practices (informal pedagogy) support design learning?
3. How have everyday routines and material practices been impacted by the transition to distance design education?

In the following section, we begin by surveying the literature on the informal pedagogy of the design studio in proximate and distance settings. We then discuss the theoretical and methodological resources needed to study students' everyday studio routines and material practices before sharing findings.

Context

Informal Pedagogy

Although the informal pedagogy has received less attention than the formal pedagogy of the studio, there have been some studies conducted in both proximate and distance settings. Gray's (2013) study of informal peer critique brings attention to the ways students talk with each other about their projects outside of formal interactions. For students, informal critiques are conversations about work in progress between peers in the studio or, for example, while

smoking a cigarette outside. These conversations provide ad-hoc opportunities for reflection-in-action – chances to talk through the design problems or make sense of what others had said about ongoing design work. In this way, informal critique offers a low-pressure environment to extend the formal critique and provides space to process, clarify, augment, challenge, and make sense of what has happened (Gray, 2013). Similarly, Arvola and Artman's (2008) study of peer interactions in a studio found students using each other in coordinated ways to get unstuck, get new perspectives and rehearse design decisions.

Shifting the emphasis – from individual to group – Ashton and Durling (2000) position the studio as a space where groups, rather than individuals, learn to design. They describe the primary function of the studio as a setting for students to establish if they are "doing the right thing". The right thing is a set of norms – for example, what constitutes good design. However, the 'right thing' is not simply established through formal interaction with tutors but emerges from a broader social process where knowledge is fabricated through daily interactions between people and things (Burr, 1995). The 'right thing' is socially co-constructed between tutors, students, curricula, profession and ideas about the discipline.

Central to this co-construction is the role of social comparison. It is through social comparison that appropriate practices and values are disseminated (Festinger, 1954). Here, students learn to locate themselves within the group and gain insight into their abilities – relative to their peers. This can happen through observation with the physical studio offering opportunities to observe body language, work and actions (Ashton and Durling, 2000).

The importance of comparison is also evident in distance settings. Findings from a longitude study of design students in a Virtual Design Studio (VDS) (Jones, Lotz and Holden, 2020) also stress the importance of comparison and demonstrate a direct correlation between the frequency of viewing work and attainment. Although viewing has connotations of passivity, Jones, Lotz and Holden (2020) argue viewing can be understood differently. First as a form of legitimate peripheral participation involving listening and looking from the edges (Lave and Wenger 1991). Second as 'lurking' – being present online but not appearing to engage actively. They argue "informal activities benefit students and explicitly active forms of interaction are not the only means by which learning takes place." (Jones, Lotz and Holden 2020, p.18)

Clearly then, in proximate and distance settings, informal pedagogy in concert with formal pedagogy has a significant role in supporting students to learn to design and become designers. Nelson and Stolerman (2012, p.224) describe this a design milieu: "The process of becoming a designer is not a solitary, individual undertaking. It always takes place within a design milieu." Elsewhere this milieu has been termed a habitus Gray (2013), drawing on Bourdieu (1977), characterizes the studio as a complex social and cultural environment. Habitus describes the pervading feeling that emerges from a given studio and is the product of social relations, beliefs and norms. For Gray, it is students' negotiation of formal and informal pedagogy that works to produce this habitus, which works to 'produce' design students.

Theoretical Approach

In our discussions so far, the design milieu of the studio has taken a social form. Yet, we wish to extend it beyond social interactions and argue that everyday routines and material practices

contribute to informal pedagogy. This allows the space to explore how the displacement of these material practices within distance design education settings can hinder informal pedagogy. To do this, we draw directly from the 'research programme' of Studio Studies (Wilkie and Farias, 2016). Studio Studies draws on the traditions of Laboratory Studies (Knorr-Cetina, 1995) and associated aspects of Science and Technology Studies (Latour, 1987). What is distinctive about these approaches is the foregrounding of material entities alongside social activity. So, while humans may use materials, materials may also 'use' humans (Sorenson, 2009). By paying attention to the materiality of learning, we see the studio as formed by a combination of things and actors that include "peoples, policies, tools, representations, learning environments and the rest — [and it is these that] make possible different teaching and learning practices". Mewburn (2012, p.72).

This approach requires us to consider the studio as a situated practice – a place where knowledge, material and practice come together (Wilkie and Farias, 2016). Crucially, such sites are approached "without assuming a priori distinction between supposedly creative acts and routine activity, or between creative actors as opposed to assistants, equipment and tools" (Wilkie and Farias, 2016, p.2). Therefore, what happens in the studio is a distributed activity, and our assumptions about what should be foregrounded – usually the conversations between tutors and students – should be challenged. This theoretical frame opens up space for us to consider formal and informal pedagogies and their interactions as social and material practices.

Method

Typically, researching design education as a situated practice suggests ethnography as a relevant methodology. However, with limited resources, we needed a different approach to encourage participants to recall and share their encounters with materials, people and space. We used ethnographic mapping (Nolte-Yupari, 2017), a process that deploys graphic elicitation and map-making. It involves using drawings (created by researchers or participants) and interviews to elicit participants' experiences and understanding (Copeland & Agosto, 2012). Graphic elicitation strives to produce a 'hinterland' between language and the graphical. This hinterland places the focus on the relations between the drawing/diagram and what is said. As Pink (2006) notes, this is not a purely visual process; the visual is interpreted within an interview context. Compared to traditional qualitative interview processes, graphic elicitation emphasises its utility with seeing the normal in new ways (Banks, 2001) and attending to the multiplicity of experiences not easily expressed in spoken or written language (Pink, 2006).

In the first part of this study, we explored the everyday routines of the proximate studio by asking participants to draw a map of the space and then to draw a series of lines to re-enact the movements they had made in the studio throughout the day, "gestural re-enactment of journeys actually made" (Ingold, 2007, p.84). In this way, ethnographic mapping was used to record and access the mundane encounters, moves, and activities of participants in the studio, but outside of formal teaching sessions. While they drew, we interviewed the participants and referred to the journeys re-enacted on their maps (see figures 2 & 3 for examples).

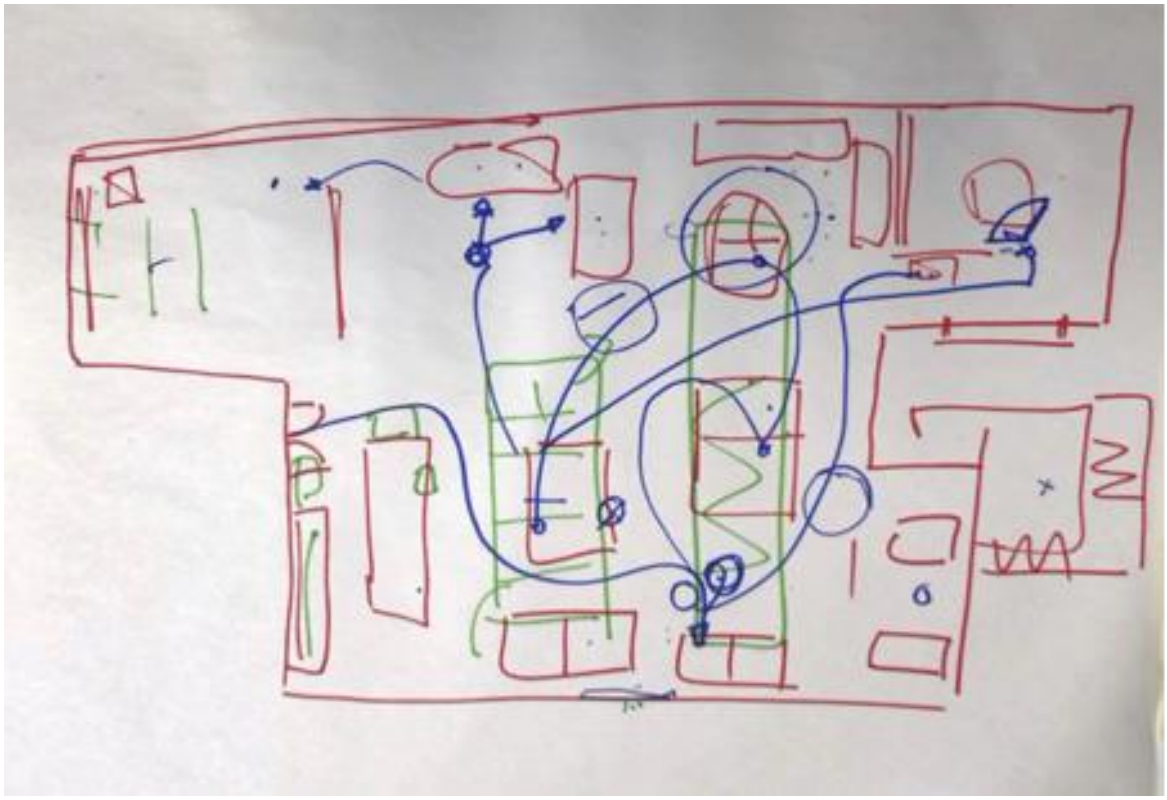

Figure 2. Participants' map of the studio, and journeys made (pre-pandemic).

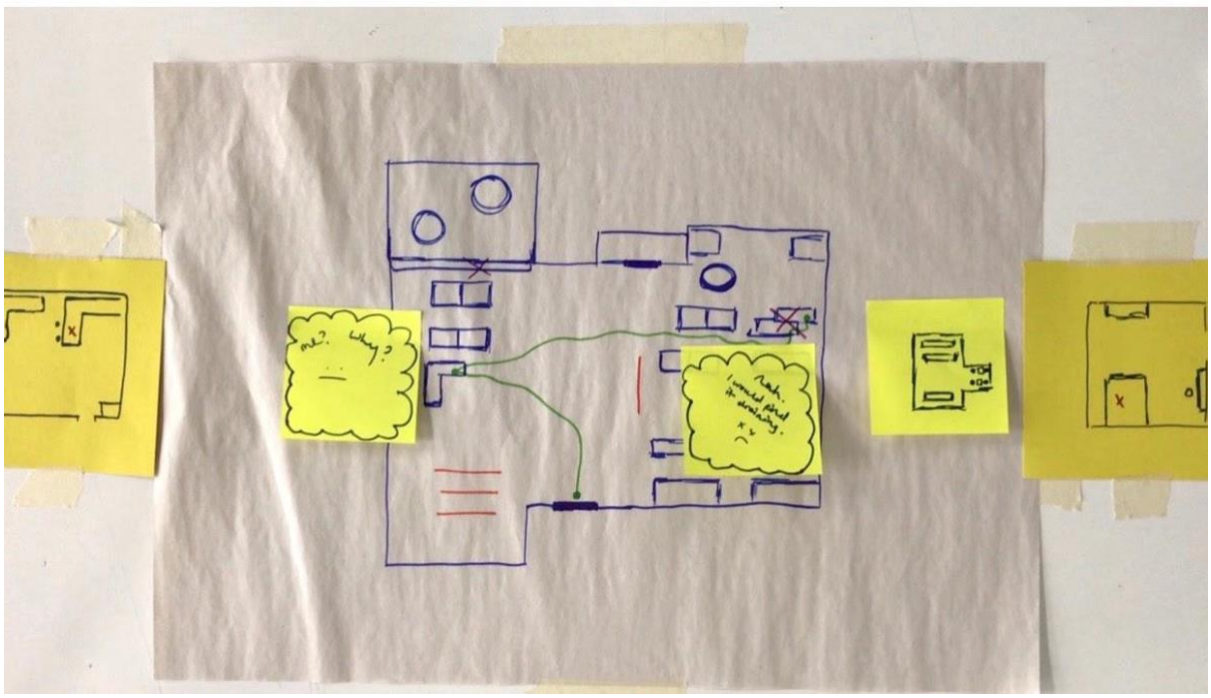

Figure 3. Participants' map of the studio, including post-its to indicate additional spaces used and journeys made (pre-pandemic).

We augmented our initial data (pre-pandemic) with students' accounts of distance design education (during the pandemic). To achieve this, we returned to the emerging themes and

held two focus groups, each with three students, to generate accounts of distance learning experiences. We conducted focus groups to gather collective views (Denscombe, 2007) on how participants experienced distanced design education. Students were asked to map their settings during these focus groups, which in most cases was a bedroom or kitchen either at home or in student accommodation (see figures 4 & 5 for examples).

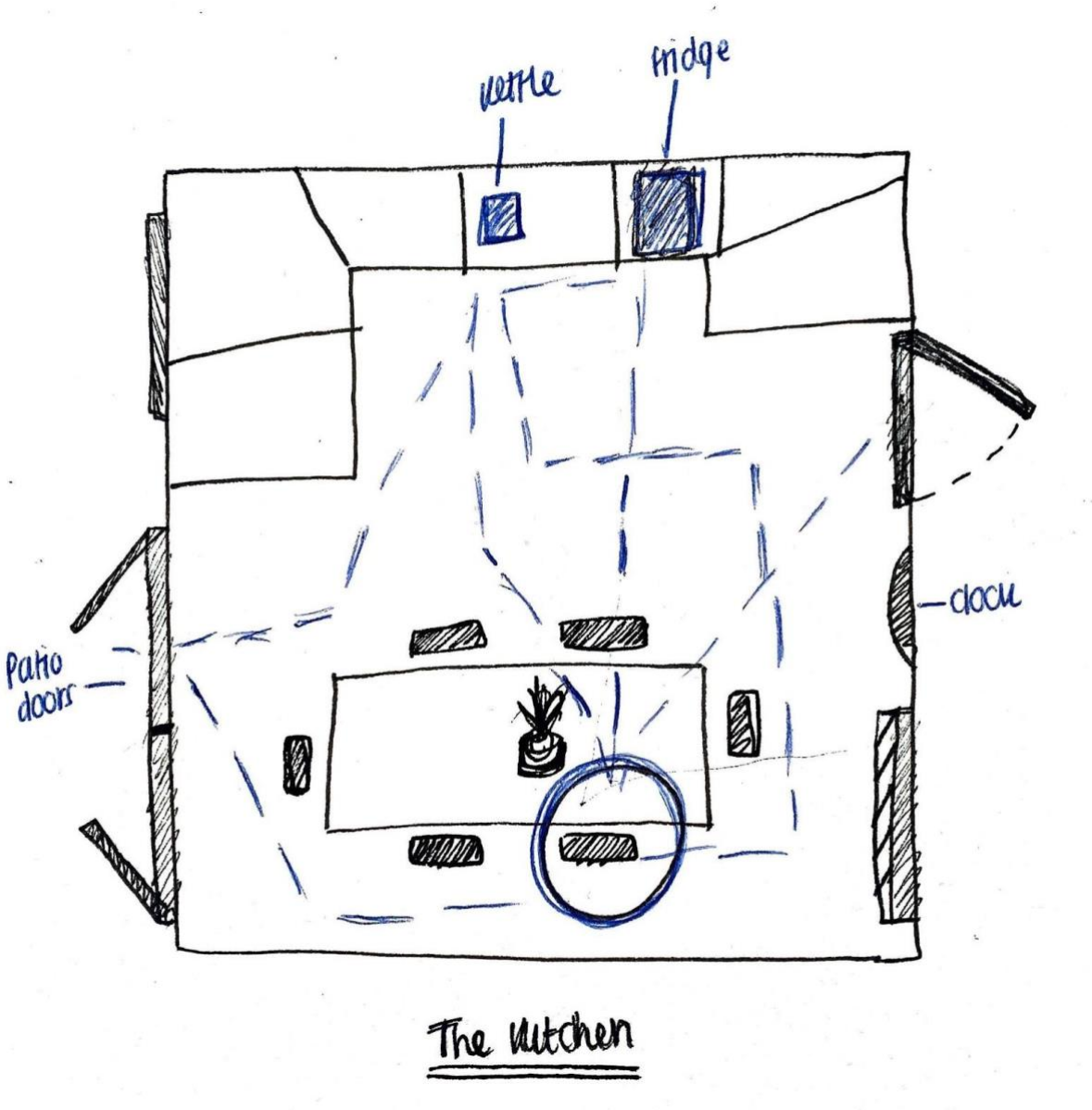

Figure 4. Participants' map of the home/work space (during pandemic).

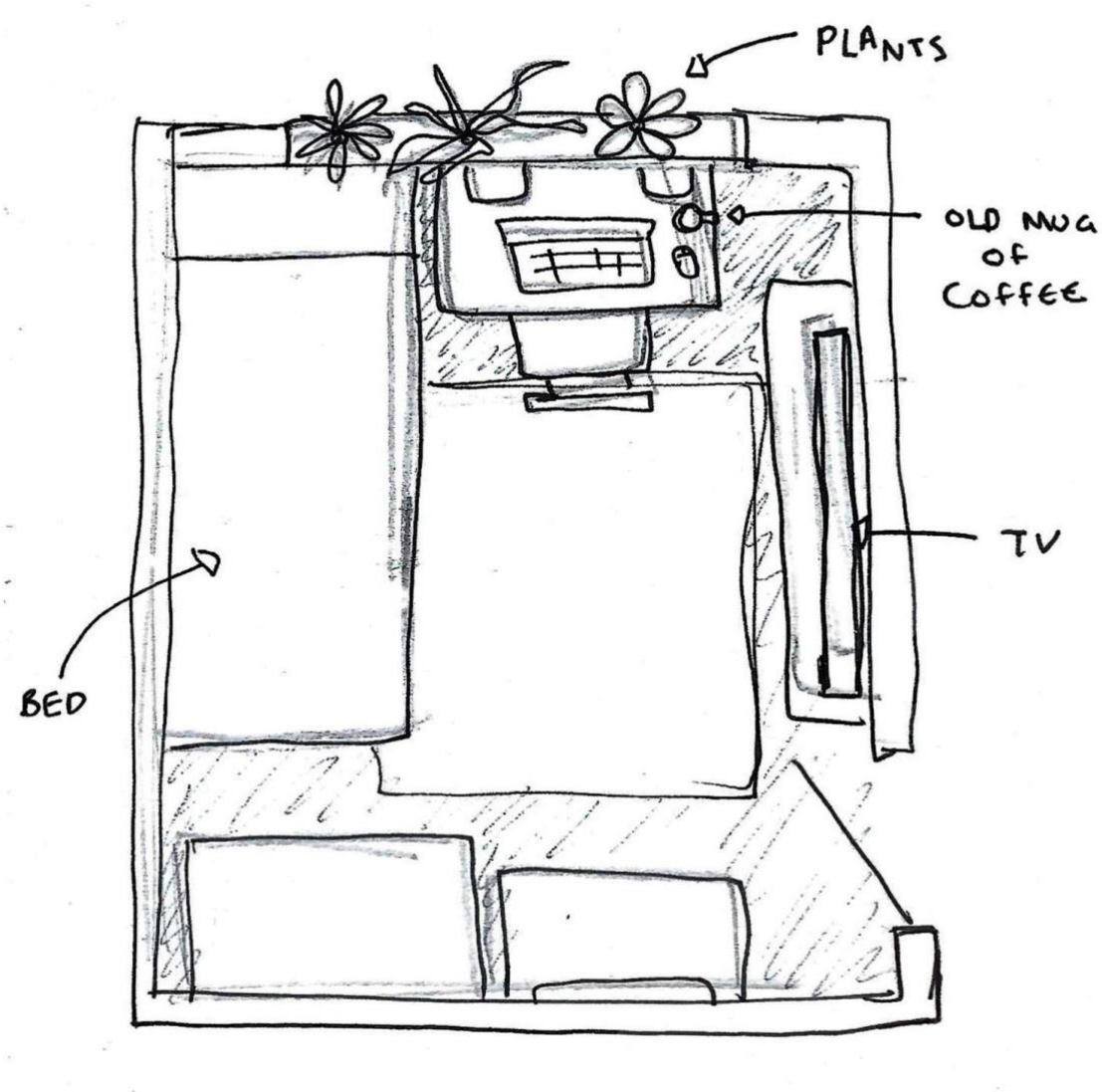

Figure 5. Participants' map of the home/work space (during pandemic).

Analysis

The site for this study is an undergraduate graphic design course in a university in the North of England. The first data set explored everyday routines in a proximate studio setting during the academic year 2019/20 (pre-pandemic) and involved seven final year participants (five females and two males). The second data set explored everyday routines in distance settings in small focus groups and composed six final year participants (four females and two males) and was undertaken in the academic year 2020/21. The second data-set drew from a different cohort of final year students who had experienced just over half their 3-year degree in a proximate studio setting, and the remainder exclusively at a distance.

In the first part of this study, we recruited participants through an advert; this attracted four regular studio users. Therefore, to ensure we could represent students who worked elsewhere, we purposively selected (Teddlie and Yu, 2007) a further three students that either used the studio infrequently or, in one case, seldom.

After conducting the interviews and generating the ethnographic maps of students' experiences, the audio, films of the drawing and the drawings themselves were put into Atlas.Ti to begin the coding process. In the first instance, we undertook a thematic analysis (Charmaz, 2014) and developed emergent coding to familiarise ourselves with the data. After extracting codes from the data, we began to make sense of these emerging quotes by comparing, checking, collapsing themes and building networks of insights.

Analysis of the focus groups became a valuable lens to read the initial data generated in proximate settings. Returning to our initial findings twelve months into lockdown, we examined and compared themes within the two data sets. The disruption wrought by the pandemic and the closure of the physical studios provided significant and productive rupture for us as researchers. It enabled us to explore and reflect on the proximate studio with a new sense of unfamiliarity.

By analysing the interview data and ethnographic maps, we developed accounts of everyday studio activities and encounters. We understood these to be accounts of the informal pedagogy that operated between the formal pedagogy of scheduled interactions. Emerging themes from these accounts were then used as sensitising concepts to understand participants' experiences of distance settings.

Results

Through thematic analysis, we came to see informal pedagogy as fulfilling five core functions, and we have called them:

The Social Studio
The Comparative Studio
The Organisational Studio
The Processual Studio
The Performative Studio

This section outlines how these functions work, within both proximate and distance settings, by drawing upon examples from the two data sets.

The Social Studio. The Social function of the studio encapsulates the interactions that happen outside of working habits. The social studio acts as a catalyst for friendships and collaboration; it describes comfort and familiarity with the space.

The Comparative Studio. The comparative function of the studio is used by students to benchmark themselves against their peers and observe each other's workings.

The Organisational Studio. The organisational function of the studio describes the way students use the space to manage projects, keep on track, and use the studio (to not be at home) to do work.

The Processual Studio. The processual function of the studio begins to unpack the different areas and places that students use to undertake various parts of the design process; this may be other places in the studio or outside of it entirely.

The Performative Studio. The performative function of the studio discusses how the studio contributed to the student's designerly identity.

The Social Studio

Proximate

The Social function of the studio encapsulates the interactions that happen outside of working habits. It is maintained through explicit and implicit tools, resources, and strategies adopted by those who inhabit the space to build and maintain the social. Compared to accounts of infrequent studio users, it became apparent that the social does more than allow the space for fun. It begins to construct levels of ownership. One of the more infrequent studio users described how they were offered a cup of tea when they came to the studio. Suggesting that they were a guest in the space and how only through regular use of the space would one feel comfortable enough to make themselves at home, to make themselves a drink. This homemaking and comfort we found were only accessible to those who spent extended amounts of time in the studio:

> *"I feel more involved in the space, I've had more input into this space so I feel more comfortable in it." (P2)*

Comfort and involvement in the social doesn't evolve by chance (Wragg, 2020) but requires a level of responsibility and ownership for the space. Our data revealed that the students who spent more time in the space felt a level of commitment towards maintaining it. These students would often adopt a custodian mentality; they would move things, add things and maintain the upkeep of the space:

> *"There's a money jar for tea and coffee. So whenever I make a brew I think have I got any change and I'll put it in. The people that do that are the ones always up making tea and always chatting and they feel more comfortable in the space." (P2)*

However, the physical studio can also bring forced sociality. The space itself is designed to make work visible, make students visible and make tutors visible. Being on display is not a mode of working that all students feel comfortable with and one of the contributing factors in why they would choose to work elsewhere. To manage the forced sociality of the space, accounts from less frequent users suggested that they would consider where they positioned themselves in the room to handle the social. Some described moving towards the edges of the room or facing a wall to avoid being on display:

> *"I found it quite intimidating, the way it's laid out means you have to sit with people. It can be intimidating to just walk in." (P5)*

Distance

We can contrast this with accounts of learning at a distance. Without the physical studio to accommodate collective studio hours, we began to see the decline of the social and how comfortable students felt with one another. Our focus group data revealed that without the constant sociality of the physical studio, the social moments dissolved to no more than a few minutes at the start of a zoom call:

> *"Back in second year, I once wore a football shirt. It created banter with tutors about football teams…that wouldn't really ever happen online." (FG1)*

Further accounts outlined the decline of the social and the informal studio. Reflections on how the tone of the experience has now become more serious. The online experience doesn't allow for humour, which often acts as a catalyst for friendships and collaborative working relationships. The lack of the social became a barrier for students in feeling comfortable joining virtual events, the absence of familiarity with their peers and their tutors adding a further layer of uncertainty.

The Comparative Studio

Proximate

The comparative studio is used by students to benchmark themselves against their peers and observe each other's workings. This function emerged from themes of proximity to feedback and 'unstucking'; we began to recognise that students working together in the space would deliberately use that proximity to ask if they were doing the right thing (Ashton and Durling, 2000). Our data revealed that close contact with peer groups encouraged frequent low-risk conversations that helped the progress of students projects in ways that were not accessible to those who worked elsewhere:

> *"...I'm missing out on being able to approach other students and see what they're doing. I often find myself asking am I doing the right thing, am I doing the right thing, I don't know if I'm doing the right thing. That's kind of what we do (as design students), we look at someone else's work and get clarification in two minutes about something I'm worrying about for days". (P7)*

As well as low risk exchanging of ideas with peers, students used the space to observe from afar what others were working, the looking over someone's shoulder to compare, the observing of what programmes and sites peers are using etc. Whilst comparison is a way for students to benchmark themselves, we found that it also became a function that discouraged certain students from feeling comfortable working in different ways to their peers. Our data contained accounts that suggested there was a level of censorship present in the studio with deliberate actions taken by students to appear a certain way when being observed by their peers:

> *"When I'm in here I won't go on some sites because I think it could look embarrassing. Because everyone in here is like really cool and professional." (P5)*

Distance

The comparative studio function became less visible online; student's had fewer opportunities to observe each other's workings outside formal project shares. However, we found the loss of the 'requirement to be seen' for some became a positive online experience. The absence of the studio liberating them from the tropes of what it means to look and behave like a graphic designer:

> *"I'm not comparing myself to other people anymore because I'm not seeing what other people are doing. Before I could gauge if I was on track by looking across the room.*

> *(Distance) has given me more confidence, it has made me move away from graphic design, I'm on the edge of the discipline now. Not comparing myself means I don't have that pressure to conform and be a graphic design student making the same work as everyone else." (FG2)*

Although the shift away from comparison was in some cases liberating, we also found it left little room for low-risk conversations that our initial data proved so crucial in a student's design process. Accounts from online experiences began to outline the student's frustration with not having other graphic designers to test ideas and measure progress. We argue the proximity of like-minded peers is vital for students to practice their design vocabulary. Without the affordance of movement around the space amongst other people, some students began to feel the influences around them were narrowing:

> *"I think it becomes more singular and focused (online) we still have crits and project shares but I think (at a distance) I get sucked into a sphere of what I think is cool and I think without having people in person looking over your shoulder or you to look over their shoulder...I feel like I haven't soaked in as much influences as I would have done before (physical studio)". (FG1)*

The Organisational Studio

Proximate

The organisational function of the studio describes the way students use the space to manage projects, keep on track, and use the studio (to not be at home) to do work. The students who were frequent users of the studio suggested that by coming in, they were able to separate home life and academic life, most deliberately spending extended hours in the studio to not take their work home with them:

> *"...I never do work at home and that's not because I'm lazy. I refuse to spend my evenings doing work at home. For me home is my space." (P2)*

The studio becomes a site that allows for separation, a space that can be used to organise how a student manages their time and their design process. Clocking in to the studio, or as student accounts describe it, "treating it as a job" (P3) outlines how the physical studio encourages focused efforts away from other distractions.

Distance

Without the physical studio as a site to manage their time and their projects, focus group data revealed that students were now finding it harder to manage productivity levels in efficient ways. Our first data set showed the organisational function acted as a tool for students to separate spaces. For example, they would use the studio to not be at home to do work. This foregrounded the importance of other spaces in relation to the studio and how separation becomes an integral part of getting things done. With all workings now condensed to the home, our data suggested that organising projects and time became harder to manage:

> *"It's so much harder to work at home, you're working at home in the same four walls. It's really hard to distinguish what's working time and what's relaxing." (FG1)*

The Processual Studio

Proximate

The processual studio refers to the different areas and places that students use to undertake various parts of the design process; this may be different in the studio or outside entirely. Analysis suggests the studio is a permeable site in which they can come and go. For most, the making happens in the studio with other tasks such as writing and research usually happening elsewhere (at home or in the library); the studio acts as a space for students to work on the things they wouldn't be able to do at home. For some, the studio serves as a basecamp, a place where they bring and leave things, a place where they will set up camp to only travel elsewhere for brief periods:

> *"I'll go to the library, get the books, come here, read the books, I don't read the books in the library, I don't read the books at home, I always do it here (studio)…all that happens in this space." (P2)*

The studio itself provides various areas that afford different working methods that students are aware of and can use to aid other moments in their design process and daily routines. Students are conscious of where they position themselves in the studio to achieve certain things. To stand near the kitchen is to be open to social distractions. To sit on the sofa is to require feedback from a tutor. To face a wall is to be undisturbed. There is a constant negotiation with space and what they want out of it:

> *"I'll come in and go here (kitchen) to make a brew...It helps me get my head in a space where I know what I'm going to do that day. Whilst I wait for the kettle, I'll plan what I'm going to do that day." (P2)*

Distance

The processual ability to come and go and travel around and through the studio to undertake different parts of the design process became less of a reality online. Students were previously aware of where to position themselves in the studio to achieve certain things, manage materials, or position themselves for social interactions strategically. The processual ability to use space to engage with the different stages of the design process were now confined to specific locations within the student's home. The focus group participants found it hard to articulate other models of operating because, for them, multiple locations were not a reality (see Figure 6).

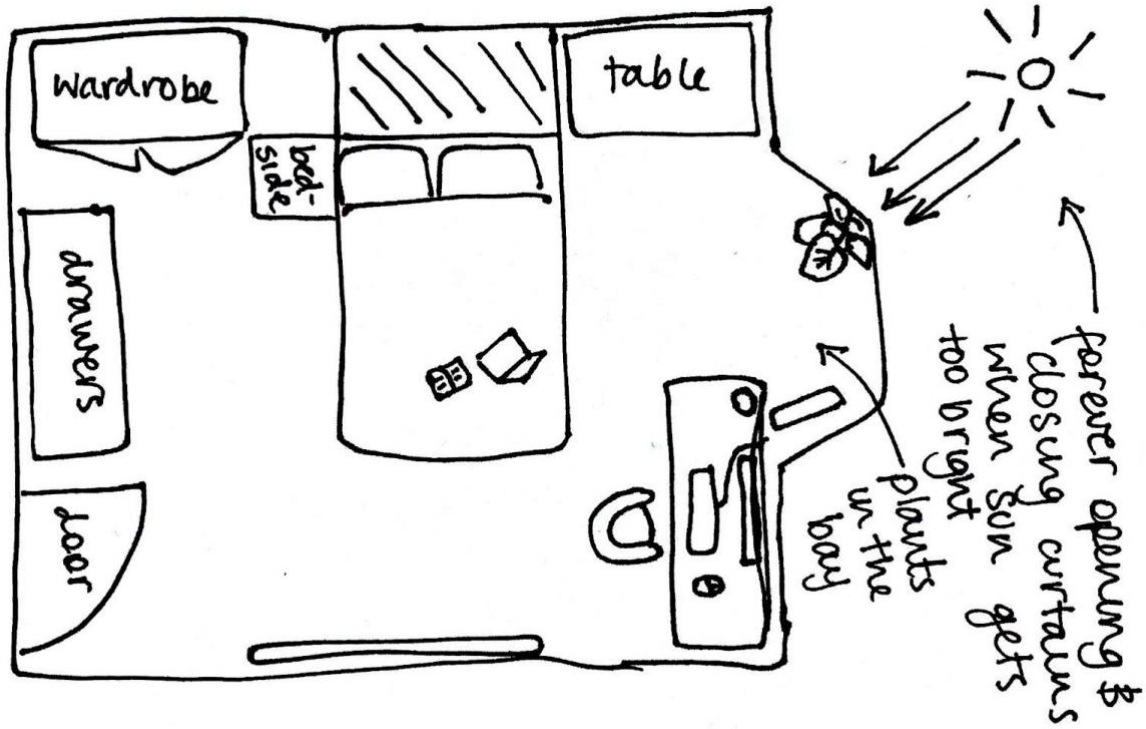

Figure 6. Participants' map of the home/work space (during pandemic).

The Performative Studio

Proximate

The performative studio emerged from reflections on how the space contributed to the student's designerly identity. It afforded opportunities for low-risk conversations to test their 'designerly talk' (Gray and Howard, 2014) and practice how to behave like a graphic design professional. The analysis also uncovered some implicit quid pro quo moments; the act of appearing engaged to those with perceived power was identified as a way to lead to other opportunities:

> *"I think it does open more doors for you (being in), I don't think tutors mean for that to happen but I think if you're in and you're engaged it does open more doors for you". (P2)*

The studio revealed itself as a site for broadcasting progress with the acknowledgement that, to some extent, actions are being observed by peers and tutors. This begins to present the studio as a stage for students to behave like professionals; one student describes the expectation of engaging in the space to be "wandering around appearing studious for at least one or two hours" (P6). These modes of performative operating suggest that actions in the studio may not be quite as spontaneous as assumed, but rather, at some moments, calculated to appear professionally competent.

Distance

The studio as a performative site was reduced dramatically in distance settings. Accounts from the first set of data that spoke of engagement with extra-curricular opportunities were not

articulated in accounts of online learning. Students also outlined that without the reminder of the studio, they struggled to formulate designerly identities at a distance:

> *"The studio for me is a very artsy space. I don't know how to describe it but do you know when you're sat in a studio environment, you're surrounded by people's work and even if it's not for inspiration it reminds you that you're an art and design student." (FG1)*

Discussion

By focusing on students' everyday routines and material practices, we have emphasised the importance of informal pedagogy and highlighted five enabling functions of the studio. These functions were impacted in distance settings. We were also curious to explore how formal and informal pedagogy intersects. Returning to Shaffer's (2007) diagram of the cycles of production and reflection (figure 1) – that effectively captures formal studio pedagogy, we can now extend it (Figure 7) to include informal pedagogy.

Figure 7 shows informal pedagogy undergirding formal pedagogy and supporting the development of creative work and designerly identities. The zones of formal and informal pedagogy are presented as a continuum.

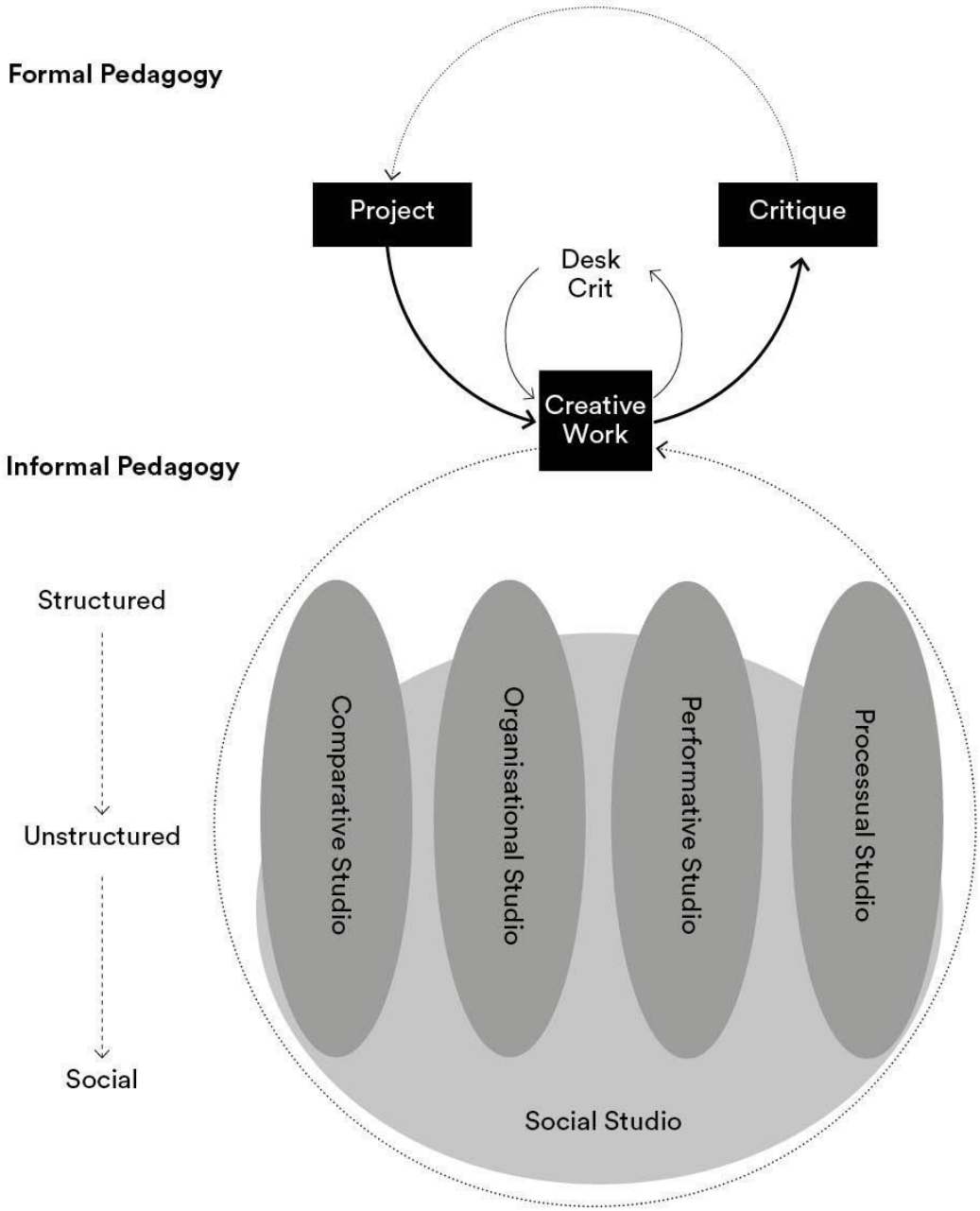

Figure 7. Diagram of the interaction of Formal and Informal Studio Pedagogy.

Formal pedagogy is where traditional instruction happens – desk crit, project share, critique, workshop, lecture. *Structured Informal Pedagogy* is where careful consideration of the informal occurs. We have taken this term from Lim, O'Halloran & Podlasov (2012), who use it to articulate how teachers construct less hierarchical learning environments. Here we extend this idea to include the deliberate design of learning environments that can foster the five functions described above. This can take a material form – the use of soft furniture – but it is also how tutors and students enact this – a sofa can be a formal site of interaction if used in specific ways.

Unstructured Informal Pedagogy happens by chance and cannot be orchestrated; we see this happening as students move around the space casually, talking to each other about the things they are working on. *The Social studio* is where the studio becomes a site for building friendships, having tea and a chat whilst Christmas decorating etc.

There are interdependencies between these zones – for example, creating opportunities for structured informal pedagogy may increase the chances for social interaction and vice versa. The social lubricates the comparative, organisational, processual and performative functions. In pre-pandemic proximate studio accounts, the social was deeply meshed with material and spatial practices of the studio – making tea, wandering around. The move to distance education precipitated a decline in social interactions that the introduction of group social media platforms couldn't compensate for.

Ashton and Durling's (2000) study of a proximate setting showed that socially isolated students (even if they used the studio) were less able to access comparative opportunities rendering them "powerless to direct their own development" (2000, p. 9). In contrast, the VDS studied by Jones, Lotz and Holden (2020) enables students to view work without social interaction and, therefore, may not limit those socially isolated students from the learning that can arise in informal pedagogy. Clearly then, informal pedagogy (in proximate and distance settings) needs to consider which students the informal is afforded to.

In this study, students' everyday routines and material practices were significantly impacted by distance design education – while noting this is based on accounts of a particular distance context **–** the results suggest the absence of the physical studio interrupted the five functions. With most online interactions mediated by tutors, formality became the core studio experience. The informal and often implicit modes of operating that the physical studio allowed for disappeared: looking over someone's shoulder, benchmarking from afar, the quick chat whilst the kettle boiled. It left only the formal pedagogy behind: desk crit, critique, workshop.

The loss of opportunities for comparison had varying consequences in distance settings: a narrowing for some and liberation for others. The conflation of home and study (wrought by the pandemic) led some students to actively adapting their environments by creating 'artful surfaces' (Vyas & Nijholt, 2012). Despite this, however, a pervading sense that students' designerly identities were less sure and less formed remained. Suggesting these designerly identities are formed partially in the presence of others and require material and spatial conditions.

This leads us to formulate the idea of the proximate studio as a 'regulated freedom'. It is simultaneously regulated by powerful norms and expectations while constituted of openness and a sense of possibility inherent in creative practice. In contrast, distance education in this context offers 'unregulated freedom' – a loosening of some norms and expectations alongside openness of creative practice. Paradoxically, the distance setting worked to narrow the approaches for students who feed off seeing their peers at work. Yet, for others, it liberated them from the tropes of what it means to look and behave like a graphic designer and challenge the representation of the studio. This is powerfully articulated by one respondent, a student of colour and significantly in the minority, who discussed finding new and more

representative communities online. Crucially the power 'exerted' by the studio and those that came into it were reduced at a distance.

Conclusion

Shifting our attention from the interactions (between students and tutors) towards students' everyday studio routines moved our focus from *formal pedagogy* to *informal pedagogy*. In the process, we rendered different facets of studio education visible.

First, it substantiates informal pedagogy as a critical component of learning design (Gray, 2013; Ashton & Durling, 2000; Jones et al. 2020). In particular, we argue the informal undergirds formal pedagogy through five functions: social, comparative, organisational, processual, and performative. By identifying and naming these functions, we, as educators, might better articulate what the studio does outside of formal interactions.

Second, these results illustrate how much design education happens outside of the formal pedagogy of the studio. Suggesting, along with Jones (2021), that the visible practices of the studio, although well documented, are only part of how studio education happens.

Third, we propose the studio is a place of intersection between formal and informal pedagogy. A space that extends and undergirds formal interactions. Where material, spatial and temporal qualities – open spaces, open hours, open timetable – enable a range of functions that serve the process of learning to design.

Fourth, distance settings hindered these functions because, in the context of this study, the infrastructure of the physical studio that enables informality was missing. We should prioritise designing the infrastructure for informal pedagogy to thrive in hybrid and distance settings.

Although distance settings hindered the five functions of the studio, we also found it ruptured some of the patterns of the proximate studio in productive ways. It suggested cautious attention needs to be paid to the design milieu and how this powerful co-construction of knowledge and becoming – both regulates freedom in ways that are productive for some but delimiting for others.

Finally, we urge that considering degrees of informality may also help educators actively set conditions to support and enable the identified functions.

Further Research

Access to informal pedagogy is also unlikely to be evenly distributed, particularly for those isolated from peer groups. So, while it might be a space from which students challenge the positions of the formal pedagogy, potentially in less hierarchical ways, further research would be helpful.

An element that is not currently clear in this study is the role of tutors. While we suggest much informal pedagogy can be deliberately structured – or at least the conditions and infrastructure can be designed to encourage it – we are unclear whether these conditions can be enabled or discouraged with tutors in proximity. Indeed, at a distance, very few spontaneous spaces

appeared to replace the informal pedagogy of the studio, suggesting that structured informal pedagogy in tandem with encouraging social integration may be needed.

Finally, we ask to what extent is informal pedagogy an integral part of learning in other disciplines? Further research that asks how informal pedagogy could be accessed and practiced across broader domains would be helpful.

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Global Design Studio: Advancing Cross-Disciplinary Experiential Education During the COVID-19 Pandemic

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Abstract:
The COVID pandemic forced universities worldwide to shift to remote and online formats of teaching delivery. In design education, this shift has impacted Experiential Education (EE) pedagogical approach to studio teaching, an approach that gives students an opportunity to apply theory to a concrete experience in a reflective manner and provides cross-disciplinary learning opportunities. This paper discusses Global Design Studio (GDS), a collaborative cross-disciplinary teaching initiative between three design disciplines across three continents: Industrial Design in Australia, Interaction Design in Canada, and User Experience Design in Germany. The objective was to develop a support framework during emergency situations to facilitate cross-disciplinary EE to design students. This paper discusses the three teaching experiences as case studies that offer opportunity for deep analysis and reflection of challenges and enablers to EE education in the shift from traditional design studio to remote and online delivery. While navigating COVID-19 barriers to EE education, GDS aimed to achieve these objectives by sharing resources, ideas, and expertise across the three universities. Each unit dedicated the entire academic term to a first exploration of GDS through a semester-long project 'Interactive Mannikin for children to learn CPR techniques'. This article discusses the context and outcomes of EE teaching and learning experiences at each unit. This paper also reviews the lessons design educators learned about: inter disciplinarity, inter-intra-cultural issues, group working, timing, remote collaboration, and proposing a GDS model for cross-disciplinary EE.

Keywords
experiential education, higher education, design education, product design, interaction design, user experience,

Introduction
Experiential studio-based learning fosters critical thinking and interpersonal skills. It prepares students to work on real-world projects and acquaints them with issues they will encounter in the workplace (Strait & Sauer, 2004). Developed from the tradition of 'learning by doing', design studios are recognized as the signature pedagogy for creative disciplines (Chamorro-Koc & Kurimasuriyar, 2020). Cross-disciplinary education is an important component in design education with the emergence of new technologies and human-centred design research methods which are applied to real-world multidisciplinary contexts.

Due to COVID-19 social distancing requirements, the shift of our studio classes to online and remote delivery formats critically impaired students' experiential learning and our teaching in

design studios (Christian et al., 2020). The shift disrupted cross-disciplinary student learning as access to resources, such as experts and community partners, was restricted, and communication between all stakeholders involved in the teaching and learning process was impacted.

We created a 'Global Design Studio' (GDS), a cross-continental, cross-institutional and cross-disciplinary initiative, to mitigate challenges imposed by COVID-19 in design studio-based learning experience and cross-disciplinary design education. The goals of GDS are (1) to create a real-world project for students to work on, (2) to provide a design studio experience for students through 'learning by doing' activities integrated into the course (3) to facilitate sharing of cross-disciplinary guest lectures and resources, specifically in the following three areas of authors' expertise: interaction design, experience design and product design, and (4) to provide avenues for students and course directors to reflect on their learnings and experiences.

To meet GDS goals and objectives, the authors collaborated to deliver remote studio courses in industrial design, interaction design and user experience design in their respective institutions. The collaboration focused on developing a design brief, experiential learning activities based on principles of 'learning by doing,' resources to support carrying out these activities and materials to facilitate student assessments and reflections of their work. In the following sections, we describe background literature and previous work on studio-based design education and cross-disciplinary learning. We then provide a description of GDS to navigate barriers presented by COVID-19 restrictions. Finally, we present lessons learnt, future directions for GDS, and propose a framework for GDS's approach to cross-disciplinary studio-based education in COVID-19 and other similar emergency situations. We also believe that instructors could easily integrate GDS framework to non-COVID situations, which will have to be evaluated in future.

Background

Experiential Learning in Design Education

Experiential Education (EE) is the application of theory to a concrete experience, either within the classroom or within the community, which advances the learning outcomes of a course or program and requires students to reflect upon their learning. EE involves experiences that (1) encourage active learning and (2) include structured reflection, motivating students to make sense of it by considering relevant course material. Reflective learning exercises integrate student learning experiences with the concepts/theories addressed in the class (Ryan & Ryan, 2013).

Experiential learning is a process in which knowledge is attained through the transformation of experience (Kolb, 2014, p.304). John Dewey's experiential learning theory suggests that learning happens in a social context, and knowledge is generated through real-life experiences. Thus, a teacher's role is to facilitate experiences that provide context for course content (Roberts, 2003). EE allows students to adapt their learning to their abilities and readiness to learn. Each student generates new knowledge unique to their quality of experience which they apply to new situations resulting in the construction of new knowledge.

Opportunities are thus created for students to 'experience,' which are then reviewed, reflected upon, and assessed in three stages: reflective observation, abstract conceptualisation, and

active experimentation. Students consciously experience new learnings and concepts. These individual experiences of learning a new skill or improving upon a practice are recorded with specific examples, in which the students explain their observations, feelings, and thoughts. Students reflect upon their notes by asking questions such as: what worked? What failed? Why did the situation arise? What did others do? During the abstract conceptualisation stage, an individual questions their own reflections using guiding questions such as: what could I have done better or differently? How can this be improved? People identify different ways to deal with the same experience and develop improvement strategies through consultations with experts and peers, resulting in new ideas. Students then apply and practice their newly acquired theoretical knowledge and ideas. Some ideas will work, and others will not, which will form the basis for a new cycle of the experiential learning model, as the experiences in the active experimentation stage become new concrete experiences. Thinking and reflecting about the experience is central to EE. Reflective thinking on experiences generates understanding and transformation of experiences to knowledge (Baker et al., 2002).

Studio-based learning can be used to introduce experiential design education in classrooms, whereas pedagogical strategies are based on semi-structured learning around a project and problem-based learning (Crowther, 2013). Design studios provide an engaging mode of learning by doing and making. Students create and reflect upon iterations of prototypes varying in fidelity for new explorations. A design challenge or open-ended design brief is provided and students iterate their design and development through critiques from the lecturer and peers (Cennamo, 2016). Studio activities include ideation sessions such as co-design workshops (Boudhraa et al., 2021), 'doing' and 'making' tasks, such as prototyping using sketching and situational materials (Tovey, 2015; Vyas et al., 2013), guest lectures (Ham & Schnabel, 2011), and role-play of ideas (El Zeini et al., 2021; Gencosmanoglu et al., 2011). Studios can occur outside the classroom setting, such as during a field visit to a course-relevant site, an interview with users or professional in the field, and participation in a community event (Cameron et al., 2001).

Another pathway for EE is through involvement of a community partner in the teaching and learning process. Community-focused EE begins with instructors collaborating with partners to understand their needs, areas of investigation, design, and development. Though EE can happen within or outside of the classroom, the partner is involved at every step of the learning process. With the advent of design methods that focus on designing with a project's stakeholders, instructors are increasingly applying community-focused EE methods in their classrooms. However, there is limited literature discussing the methods and outcomes of community-focused EE. Cook & Cutting (2014) conducted a year-long research project that investigated student engagement with communities that derive self-reliance from local natural resources. When asked to evaluate the experience, student responses ranged from enthusiasm to skepticism, while community members provided a direct recount of the context, living close to nature with limited resources. This discovery allowed students to discuss and develop reflections and make connections between the theory of sustainability that they were familiar with and their experiences.

In the North American winter of 2020, the COVID-19 pandemic forced all post-secondary teaching and learning to convert to online or remote formats. Moving studio and community-

focused learning online presented challenges such as a lack of access to community partners and stakeholders for user research. In addition to facing challenges at professional and personal fronts, instructors had to move physical and tangible studio activities to a remote format. Christian et al. (2020) proposed an integrative model for implementing EE in online teaching during COVID-19. The researchers combined Schoel & Maizell's (2002) adventure wave with Kolb's (2014) experiential learning cycle into three phases. During the briefing phase, each activity is explained to the students. Next, during the 'doing phase,' students perform the experiential activities. Finally, during the debriefing phase, students reflect on the experiences, discuss their significance, and identify how they will apply their new knowledge. Christian et al. (2020) discuss two case studies of theory courses where the proposed model was used. In the briefing session, (subject) introduce an existing theory to the students who then explore the concepts in the doing and debriefing sessions.

However, the 'doing phase' in design education also involves making iterative prototypes of varying fidelity along with carrying out experiential activity.

Cross-disciplinary Education

Disciplinary knowledge and skills are limited in how they address real-world problems in a connected world that are challenged by global health and environmental issues (Meyer & Norman, 2020; Mok, 2009; Self & Baek, 2017). With advancements in technology, the emergence of knowledge-based society, and design increasingly being seen as a tool to create opportunities and solutions to meet United Nations sustainable development goals, it is important for design students to gain cross-disciplinary knowledge and the ability to work across disciplines (Self et al., 2019). For example, it is important to consider what skills and knowledge are required for designers to develop appropriate IoT design solutions and how designers can contribute to the solution of complex systemic problems.

Schaffer et al. (2012) refer to cross-disciplinary learning as an ill-structured learning environment but with improved results in terms of student efficacy. Similarly, the significance of collaborative learning and social learning in cross-disciplinary settings is evident (Machemer & Crawford, 2007; Pennington, 2008). Student success was evaluated through questionnaires and GPA score improvements. Design education involves multidisciplinary engagements at two different levels: context-based engagements and design-specific engagements. Application-based engagements provide information about the context of design, such as better understanding of the issues at hand. In contrast, design disciplinary engagements provide different perspectives and approaches to the same problem. The COVID-19 pandemic affected both engagements and it was the objective of GDS to transfer cross-disciplinary learning to online/remote formats through cross-continental collaborations.

Methodology

Global Design Studio Background

GDS involves three design educators and researchers with a common interest in the design of interactions and experiences. They teach product design, interaction design, and UXD on three continents, in Australia, Canada, and Germany respectively. These three locations are learning and teaching nodes for co-disciplinary GDS collaboration. Marianella Chamorro-Koc's research experience is in the design of health technologies. As a design educator in Industrial Design, she

specialises in the course design and delivery of 'interactive product design' at the Australian L&T node of GDS. This course focuses on tangible interactions and requires interactive prototyping with a sustainable and local manufacturing approach.

Ingrid Stahl brings extensive industry experience to User Experience Design (UXD) education at the German L&T node of GDS. As an educator, Ingrid Stahl specialises in medical and healthcare technologies and UXD of screen-based interfaces. Marianella Chamorro-Koc and Ingrid Stahl have collaborated on previous interaction design projects.

Shital Desai is a researcher in inclusive and accessible interaction design. As a design educator at the Canadian L&T node of GDS, she teaches courses in human computer interaction and speculative and systems design. Shital Desai and Marianella Chamorro-Koc are former colleagues at the Australian L&T node and have both worked together on the interactive product design course.

The GDS initiative brought together three experts in interaction design in three different applied disciplines to collaborate on facilitating cross-disciplinary EE to their students during COVID-19. The previous associations between the authors provided a context for peer collaboration. Reflection-on-action was possible through iterative and continuous communication which was achieved by overcoming time zone differences, varying cultural and pedagogical settings across the three student cohorts, interdisciplinary distinctions, and differing expectations in terms of students' learning outcomes.

Our previous collegial experiences and motivations around developing appropriate learning experiences for our students prompted the opportunity to collaborate. The initial motivation was to address the problems imposed by COVID-19 conditions in which our design units could not support our students' 'learning by doing', peer learning, prototyping and in-class feedback. Given semester time differences, our GDS collaboration started in July 2020 at the Australian L&T node, followed by the Canadian L&T node in September 2020, and then by the German L&T node in October 2020. The collaboration setup consisted of:

- One design project brief: defined by the Australian L&T node, and then adopted and adapted by the Canadian L&T node and German L&T node, according to the learning requirements for their units.
- Students' international collaboration: Students in the Australian (Product design) and Canadian (designed interactions) L&T nodes volunteered their final designs as starting point for the students in the German (Interface design) L&T node.
- Lecturers' international collaboration through digital tools: Padlet, video recorded guest lectures, zoom meetings.
- Involvement of industry partners and stakeholders: the project emerges from a real-world need and therefore, community participations (industry and relevant stakeholders) were sourced at each university to work with the students' cohort.

The Design Project: Designing an Interactive CPR Manikin to Teach Children the Technique

Marianella Chamorro-Koc's research in design for health, in collaboration with Clinical Skills Development Services from the Metro North Hospital and Health Service (MNHHS) in Queensland (Australia), had identified the opportunity to develop a low-cost simulator to teach the community the cardiopulmonary resuscitation (CPR) technique. From an industry perspective, most manikins (or simulators) are computerised and involve advanced manufacturing processes which makes them costly and specialised for clinical use and professional training. Other manikins for community training (e.g., Red Cross training) offer lower cost solution, but are not dedicated to the broader community. For example, CPR training is not offered for children at primary schools. This discrepancy introduced a design problem and familiar context in which students could engage with the project.

Children as young as 9 years old could learn the basics of CPR, and countless examples demonstrate that children can save lives by performing CPR. Although children might not have physical strength, it is known that children possess the cognitive skills to apply the compression technique correctly. Different organisations worldwide support the importance and appropriateness of giving CPR education to children in schools. How can designers help children learn and apply the technique correctly in the context of a primary school classroom? This was the design problem presented to the three students' cohorts in the three universities. The design problem was addressed as: an interactive child size manikin at the Australian L&T node, an embodied interaction experience at the Canadian L&T node, and as a UXD interface design (mainly App) at the German L&T node. The following sections describe the work done at each university.

Australian Approach: Industrial Design

In 2020, Marianella Chamorro-Koc developed a new 2nd year Industrial Design course: Interaction and Experience, which provided the foundation for the CPR interactive manikin design project. In this course, the key student learning outcome is the application of interactive design theories into making functional interactive manikin prototypes.

We used double diamond iterative design approach in the design of an interactive manikin, consisting of four phases: discover, define, develop, and deliver:

- Phase 1 Discover: Students explored and discovered user needs from the concrete experience of a clinician whose expertise is to deliver training with human simulators to train physicians. This understanding is traditionally supported with hands-on experiences. However, due to COVID-19 restrictions, we replaced this aspect with videos of making of those specialised simulators at the hospital, including an expert interview where a simulator was deconstructed in front of the camera for students to understand the object. The exploration of user experiences of the intended end-user —children, parents and teachers— was part of the students' end-user investigation. Therefore, in this case, gaining insights from a concrete experience was supported in a different manner. Students were asked to annotate their progress to discuss with tutors in an online journal, which tutors could review at any time, and students used to track their progress and to demonstrate the work done to their tutors.

- Phase 2 Define: Students defined and produced individual concept designs and, as a group, selected ideas and features to integrate into one concept to model make. Model making has had a profound effect on the designs. Designs have improved dramatically since weekly workshop access began in the second half of the semester. Through the 'hands-on' model making experience, students were able to test the interactions and enhance their understanding of the design problem and opportunities for improvement. The students' video recorded their models, testing, and iterative work. This work was registered in Padlet, where there were 3 different Padlet boards, one for research collaboration, another one for concept design, and a last one for final presentations. Padlet boards provided the vehicle for in-class (online) consultation and presentation of ideas to the entire cohort of students.

- Phase 3 Develop: Although students worked in teams of 4, the project provided opportunity for individual learning through a discover-define-develop process. This process was focused on manikin part design. Each member of the student team chose what part of the manikin they would develop in terms of the technical specifications for manufacturing. Once again, the weekly reports and consultation with tutors, as well as their recordings in Padlet, provided the opportunity for students to reflect on their work, see other students' work, and discuss their progress with the tutors. Individual focus on part design**:** Students were all required to do some CAD and to do product development of their individual part of the overall design.

- Phase 4 Deliver: Padlet was used to record students' process and progress, but also provided the means for remote presentation of the project to the industry partner. The delivery consisted in a fully working prototype that can be seen in our Padlet board in Figure 1, and in videos demonstrating how the manikin works, its value proposition, as well as the part design for product development.

The team at the Australian L&T node of GDS had to adapt the course for online/remote teaching in the following areas:

Making and Doing activity: A key challenge in this course is to teach industrial design students to use Arduino technology to 'make and demonstrate' interactions with the manikin. Prior to COVID-19 restrictions, this was solely done through in-class face-to-face workshop sessions introducing students to physical and material interactions using Arduino and fabrication technologies. In the shift to teaching online following COVID-19 restrictions, Marianella Chamorro-Koc engaged a team of tutors (teaching assistants) in developing strategies and resources to provide a supportive learning environment in remote, online, and asynchronous teaching and learning conditions. Aware of the challenge of making prototypes at home without materials or tools, Marianella Chamorro-Koc redesigned the course content to support students in achieving a viable learning outcome. One of the essential strategies was to replace the face-to-face workshops and demonstrations with the making of interactive prototyping demonstration videos.

Sharing design iterations: Studio-based collaborative learning spaces were replaced with Zoom facilitated virtual spaces. Marianella Chamorro-Koc employed Zoom (a synchronous format) in combination with Padlet (an asynchronous format) for collaborative learning in place of design

studio classes. Aiming to provide a similar collaborative environment to our traditional design studios, students posted sketches and videos of their designs on Padlet to share with their peers, in the same manner as pinning their sketches up on a wall. They then had live presentations with feedback and discussion, alongside the additional potential for students to 'like' each other's designs and for tutors to write comments on Padlet. This combination of a synchronous and asynchronous approach was effective in creating a supportive learning environment where students could review feedback and build on ideas, and for tutors to review timelines of student progress. Meetings with tutors during and after each session allowed us to reflect-in and on-action and effectively support them improve their teaching practices.

Field visits and experience: The concrete experience of students attending the hospital and interacting with real manikins had to be replaced by a recorded guest lecture about CPR and a demonstration of a clinical manikin by our industry partner, made available online. The synchronous learning that would normally take place through hands-on activities to address design problems had to be replaced by asynchronous and remote interactions via email and class discussions on zoom.

Figure 1. shows Australian GDS L&T node's Padlet and their outcomes in their final design presentations through prototypes, design fiction videos, and posters (available at: https://padlet.com/mchamorro8/HealthTech).

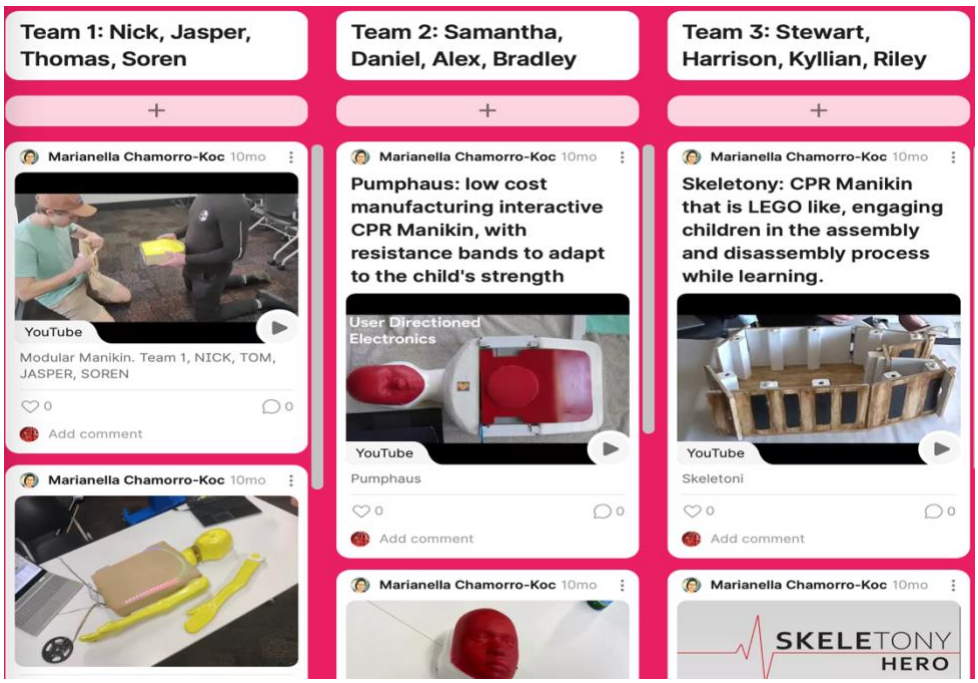

Figure 1. A section of the Padlet board from the Australian L&T node of GDS

Canadian Approach: Interaction Design

'Designing for Human Interactions' is a 2nd year, 3 credit course, in the department of design at the Canadian L&T node of GDS. The course introduces design students to the concepts of interaction design: tangible and embodied interactions, focussing on human interactions with

digital, physical and mixed reality interfaces. Students learn inclusive and accessible design of tangible interactive interfaces to meet user needs, through human-centred design principles and user research methods.

In the fall semester of 2021, students worked on a semester long project -'designing interactions with a Manikin for children learning CPR technique'. This project focussed on designing interactive interfaces and devices to help children learn CPR techniques through interfaces that respond to tangible interactions.

To provide students with expert consultations and ongoing critiques on CPR training and accessible design principles, Shital Desai partnered with Rebecca Boyd, manager of intramural sports, sport clubs, aquatics, and first aid and Melanie Baljko, an expert in accessible design at Lassonde school of Engineering. GDS members also provided guest lectures through pre-recorded lectures.

Students and faculty did not have access to the university campus resources as fall and winter semester teaching was entirely carried out remotely. A four-hour class each week consisted of a one-hour lecture followed by a three-hour studio session. Lectures focused on introducing principles of interaction design (affordances, metaphors, conceptual and mental models, embodied, tangible, and intuitive interactions), accessible design, and designing for children. Studio sessions included synchronous and asynchronous hands-on activities that provided experiential learning on the concepts introduced in the class. These activities included using cultural probes, sketching interactions, carrying out observations and user research, expert critiques, and peer feedback. Three dimensional and computational prototyping was not possible as students did not have access to the fabrication lab and physical studio space. Thus, prototyping was carried out using techniques outlined by Buxton (2010) and Greenberg et al., (2011) on sketching experiences and interactions.

Students used an iterative design process that involved four phases of the double diamond model – Discover (establish user needs), Define (interpretation and alignment of findings to project objectives), Develop (design led concepts and proposals iterated and assessed), and Deliver (process outcomes finalised and implemented) (Jaye et al., 2015). Kolb's reflective learning model suggests that reflection is important for EE education which was integrated in each of these four phases of the design process through following weekly activities and assignments:

- Reflective journal: students reflected on their weekly design process in a journal asking questions such as: what worked for them, and what did not? They asked 'why' and 'what if' questions to brainstorm ideas and alternatives for next step forward.

- Process work: doodling and sketching helped designers to "think differently, generate a variety of ideas quickly, explore alternatives with less risk, and encourage constructive discussions" (Leblanc, 2015). Students used sketching as a visual communication tool; however, they found it difficult to use it as a thinking or a design tool for problem solving and ideation. Thus, every sketch representing a design idea was critiqued by peers and experts. Students were encouraged to use cultural probes, personas, narratives and

storytelling and other tools to understand user and systemic context to refine their ideas. The process work was evaluated for evolution of the idea, justification of the design choices, discrimination and refinement, the pertinence of the signs, visual cues and analogies used to express and communicate design features.

- Peer and expert critique: Sketches representing design ideas and conceptual models of the design are critiqued by peers and experts synchronously on Zoom sessions, either in the main room during student presentations (for example interim progress presentations), or breakout rooms and asynchronously on Padlet, Miro, discussion forums on e-class, and outside consultations (requested by students via Calendly).

COVID-19 prevented in-person field work and site visits. Thus, concrete experience was facilitated through video observations and demonstrations, expert consultations and lectures, and the research assignment that covered user research and technology explorations. User research methods included surveys, interviews, and observation studies which were then synthesised using People, Activities, Context, Technology (P.A.C.T) analysis and clustering methods such as affinity analysis (Bateni et al., 2017). GDS members contributed their expert knowledge through pre-recorded lectures and demonstrations. Every experience was reflected upon in a reflective journal, prototyping and peer feedback, and expert critique to inform next level of exploration in the design process. This contributed to a new concrete experience. GDS members contributed resources on prototyping which allowed students to develop a personal prototyping strategy depending on individual personal situations. Some students used materials available at home, such as a cardboard and paddle pop stick, while others used sketching as a tool to conceptualise their design through motion graphics and animation tools.

Finally, all the individual projects submitted by the students were evaluated by a group of CPR trainers (represented by Rebecca Boyd) to identify three projects that could be commercialized further and led by the student and mentored by author 1. Figure 2 shows the Padlet board of students' final design (poster, conceptual prototype, and presentation) at the Canadian GDS L&T node (https://padlet.com/satslab/6sfn7xbkml1ghq04).

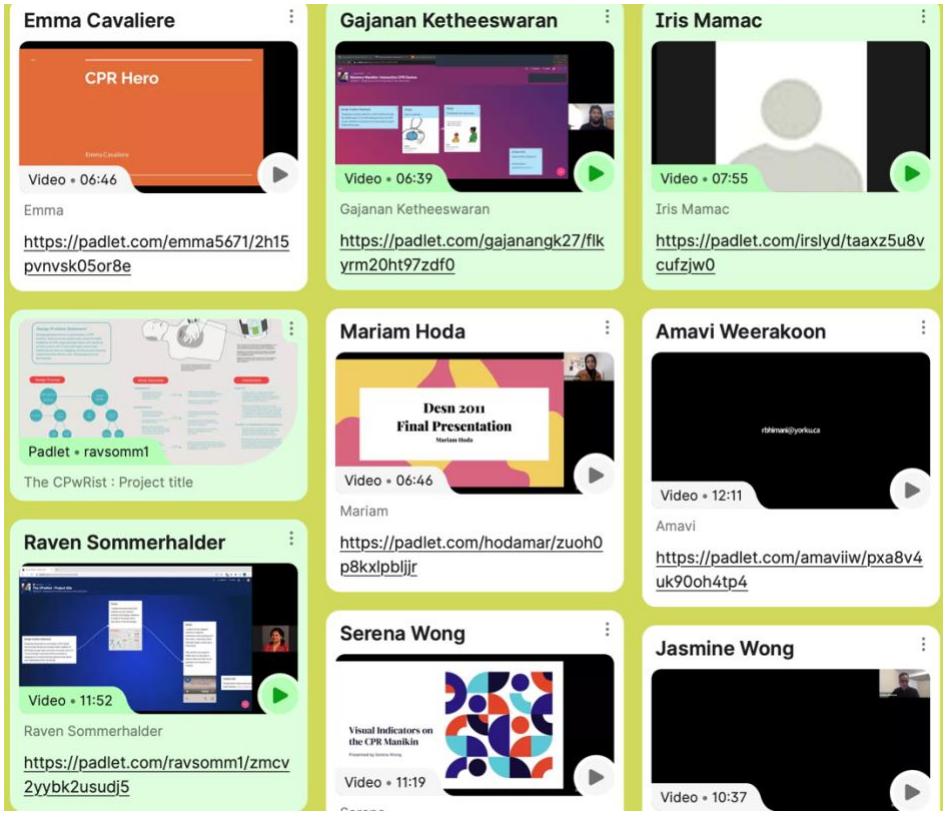

Figure 2. A section of the Padlet board from the Canadian L&T node of GDS

German Approach: UXD at THI

The UXD students at the German L&T node created user interfaces based on the projects developed by the product design and interaction design students in the Australian and Canadian L&T nodes of GDS respectively. During the first few weeks, the students in the German L&T node had weeks on-campus, face-to-face learning which allowed them to get started with the course. Students met with an expert, Dr. med. Micha Bahr, Director of the Clinic for Pediatric and Adolescent Surgery in Ingolstadt (Germany) and CPR trainer for children. Then, the course was transitioned to online/remote teaching and learning which mostly happened on Zoom. While each team of students presented their designs to the entire class on weekly basis, they also took feedback and critique from a partner in breakout sessions. The German team used Moodle/e-class as a central place for sharing course content and submitting assignments and a Miro Board for brainstorming, Sketching (analog and digital), Adobes Creative Cloud (Illustrator, Photoshop, Adobe XD, After Effects, Premiere), and Figma.

Cross-disciplinary EE was integrated into the double diamond design process. Students worked in teams of two. The model was integrated in this process through weekly activities:

- Phase 1 Discover: Students brainstormed and discussed the projects developed by students in the Australian and Canadian L&T nodes. They researched about CPR and consulted experts in CPR training.

- Phase 2 Define: Students focused on two different target groups for the design of the interface: children as primary stakeholders and trainers as secondary stakeholders.

Therefore, they designed two different concepts in terms of paper prototyping (analog or digital) and Wireframing (Garrett, 2010; Krug, 2018). The concept was demonstrated in a clickable prototype that was used for small usability tests. Feedback from potential users and the expert, Dr. Micha Bahr, was incorporated in the final designs.

- Phase 3 Develop: Each student team created their own Persona, Mood board and Screen design for a specific use case (Steane, 2014). The students developed a storyboard to incorporate the use of the interface in the final submission and presentation (Butz et al., 2014). Students received feedback from the instructors every week during the virtual studio class.

- Phase 4 Deliver: Students presented their work on Zoom and submitted their designs with documentation and their final movie on the Padlet.

By the end of the semester, each team was able to present comprehensive and thorough work, showing all important parts of a UXD process with a focus on a specific target group and visual design (Hassenzahl, 2013; Rosenzweig, 2015). The German GDS L&T node developed interfaces for tangible products created by students in Australian and Canadian nodes.

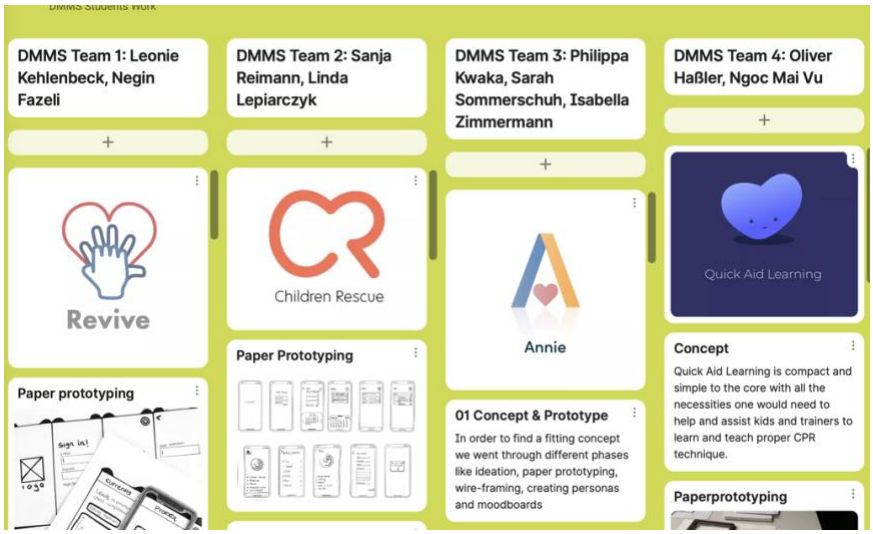

Figure 3. A section of the Padlet board from the German L&T node of GDS

Discussion

To navigate challenges presented by COVID-19 to cross-disciplinary EE, the three nodes of GDS attempted to collaborate in delivering three design courses in three disciplines of industrial design, interaction design, and UXD. The objective was to find ways in which the student engagement and experience in a traditional studio-based learning environment in these courses is maintained in a virtual environment. At the same time, it was crucial to maintain the learning outcomes stated in our design courses descriptions as these students were 2nd year design students and the learnings from this course would impact their performance in the courses they take in the 3rd and 4th year of the design programs. The three case studies highlighted following themes around adaptations and implementations of cross-disciplinary EE during COVID-19 where GDS played a critical role in making an impact. It has resulted in a GDS

model for cross-disciplinary EE (Figure 4) comprising: collaborative briefing and real-world approach, sharing of resources for remote and local activities, and cross-disciplinary collaboration.

Collaborative Briefing & Real-word Approach

All three L&T nodes experienced challenges in developing a design brief or a project for their course. In traditional format, the project would normally be informed by their ongoing research. Research outcomes and collaborations, both industry and community-based, developed during the process participated in the teaching process. However, COVID-19 had impacted this entire cycle. GDS took advantage of the fact that all three L&T nodes experienced COVID-19 waves at different times. Also, the courses were run at different times of the academic calendar. Thus, the design brief or the project initiated from the Australian L&T node was adapted by others to meet learning outcomes requirements of each specific course.

In each design course, the project briefing was carried out in two parts. First, students were briefed on the entire project and course. Then, they were briefed on individual activity (weekly studio activity, assignment, or a design process). Each of these briefs included a 'why- objective' or goal; they were instructed to 'do' (perform the activity) and 'think' (reflect on the experience). A briefing template as a resource emerged during this process.

Sharing of Resources to Remote and Local Activities

Each L&T node of the GDS developed their own activities for students to experience, assignments and evaluation criteria. Students were asked to reflect on their experience in weekly journals and virtual pin-up boards (such as Padlet and Miro). Authors shared these activities from each of the GDS L&T nodes with each other to be used in each of the courses.

Since each L&T node was progressing through various COVID-19 waves and occurring at different semester times, certain activities were feasible in some L&T nodes but not in others. Sharing findings and experiences of the students in each L&T node helped mitigate these accessibility barriers. This communication was especially useful in the discovery phase of the project when, for example, students in the Canadian L&T node could not conduct rigorous, in-person user research. Thus, they were limited to distributing surveys which were able to understand users and their behaviours.

Cross-disciplinary Collaboration

To facilitate student engagement with the content related to the project context (CPR training in children), each L&T node developed local collaborations with content experts. The local experts also provided critique to students in the local L&T node. The three L&T node coordinators/authors provided expertise in design disciplines on topics relevant to the project. For example, author 1 provided a guest lecture on embodied interactions in children, while Ingrid Stahl provided lectures on user experience design, and Marianella Chamorro-Koc gave a guest lecture on user research and information synthesis. Each GDS L&T node also developed resources on various design topics through local experts. For example, Marianella Chamorro-Koc developed video tutorials on Arduino-based computational prototyping and talks from experts on how to prototype using materials available at home. Shital Desai developed resources and explained how to use sketching and storyboarding to narrate design ideas and

prototype these ideas. All the content delivered by the experts were either pre-recorded and incorporated as a to-do item in weekly activity or presented in a virtual class (which were also recorded).

As the course progressed and students gained new knowledge, we noticed that students also became experts in their domain knowledge. This was evident in weekly discussion forums where the postings became richer in content as the semester progressed. Students met the required learning outcomes which was made evident in their final presentations and submissions of their project work. They proved their skill and ability to produce successful prototypes. At the Canadian L&T node, one of the designs won the Best Project Award at an undergraduate research competition and three designs were shortlisted for further development into a product for commercialization. The overall average student grade in the class was A (10-point grade scale).

GDS, a collaborative remote platform to explore delivery of interaction design content for our students, demonstrates that the key to this collaboration is the setup of the project, communication between the group members, student peer collaboration, and the sharing of online resources for teaching, learning and peer-work. One core aspect of GDS is peer-to-peer learning, which was incorporated in a unique way. Direct peer-to-peer collaborations were not possible due to differences in time zones and semester timelines. This worked perfectly well for us as students from one cohort informed their peers from the other two cohorts of their design outcomes. Based on the GDS initiative, we have developed a framework for EE in COVID-19. GDS provides a central repository of resources, experts, and projects to facilitate an interaction design course remotely. These resources are complemented by existing resources (materials in public domain or previously developed by GDS members and local experts, mentors who provided local context to the project). The design outcomes are shared with all GDS members through online tools such as Padlet.

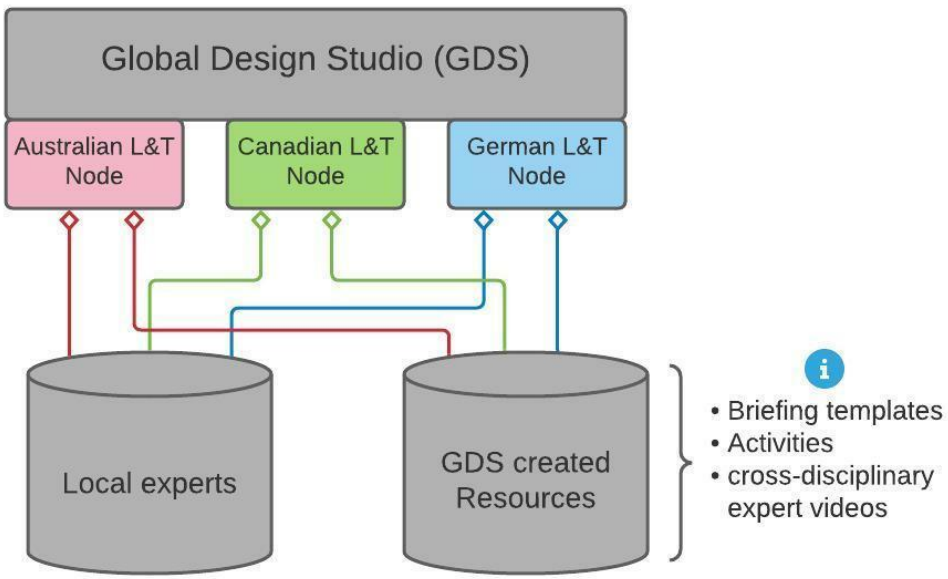

Figure 4. GDS model for cross-disciplinary EE experiential education in COVID-19

Going forward, we will continue to add to the GDS created resources. Attempts will be made to standardize practices and templates with the incorporation of GDS brand. Existing open-source resources on platforms such as YouTube and Vimeo will be added to the repository. We will develop a storage repository to provide easy access to the GDS coordinators and the students. A web platform to house these repositories will be developed which will also allow communication between GDS members and affiliates (experts, students, etc.), and the reporting of the teaching and learning outcomes.

Conclusion

In design disciplines and design studio teaching pedagogies, the COVID-19 pandemic presented ongoing challenges facilitating cross-disciplinary EE and delivering interaction design course content to the students. Through an international collaboration between design courses in Australia, Canada, and Germany, our GDS project provided a collaborative cross-disciplinary remote online platform to facilitate the delivery of content and creation and the sharing of resources for our students. Our GDS model supporting EE comprises collaborative briefing and real-world approach, resource sharing for remote and local activities, and cross-disciplinary collaboration. This model facilitated setup of a real-world project driven by user studies and expert consultations at the three L&T nodes of GDS, communication between the GDS members, student peer collaboration through use of online tools such as Padlet, and the sharing of online resources for teaching, learning, and peer-work.

The key aspects learnt to facilitate online EE in design studio teaching are: the critical importance of peer-to-peer learning in remote and local EE interactions, the relevance of collaborating on the same online platforms to allow cross-disciplinary students' group discussions, and the critical role of EE in offering a learning pathway for students to became experts in their domain knowledge.

Future work will focus on developing a web platform to house the repositories for resources and integrate existing OREs to the platform. We will also aim to standardise aspects of the teaching and learning experience, while maintaining the flexibility of streamlining the course to the local context.

Acknowledgements

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Designing During the Pandemic: Understanding Teachers' Challenges in eTwinning Projects

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Abstract
eTwinning projects support teachers and students from different countries to engage with each other through online learning. In 2020, the world started to battle with the pandemic and this shifted educational practices from face to face to online learning. In this study, we tried to understand how the pandemic influenced the activity planning, design process, teacher connections, and in-class interactions from the teachers' viewpoint. To achieve this goal, we worked with a core group of eight elementary teachers who conducted eTwinning projects before and during the pandemic. These elementary teachers started developing eTwinning projects in 2019 by using a book designed to support interdisciplinary thinking with an emphasis on design with second grade students. When we examined the activities developed by these teachers, their emphasis on design and interdisciplinary connections continued during the pandemic with the same group of students when they were in third grade. While the mindset did not change for activity planning, the complete shift to online learning created several challenges for teachers. Teachers stated that their support for the design decreased during the pandemic and they were more comfortable with assisting their students in face-to-face classes. The pandemic also reduced the connections among teachers and supporting group work became a challenge. When these aspects were combined, students had to complete an individual design experience during the pandemic and this resulted in several students missing the interdisciplinary connections in their design products.

Keywords
eTwinning projects, COVID-19 pandemic, elementary teachers, interdisciplinary thinking, design process

Introduction
In late 2019, the COVID-19 virus emerged as a health crisis in China and in March 2020 schools and universities around the world began to close in response to the pandemic, leading to drastic changes in the way school education is offered. In such a circumstance, education could only occur remotely, and hence the use of cloud-based software and services in education became a must all of a sudden (Scully et al., 2021). This situation led schools and universities to change their traditional learning and teaching methods and migrate to fully online education. This is referred to as emergency remote teaching by Hodges et al. (2020), who distinguish between planned online learning experiences and online learning provided in response to a crisis without adequate preparation or instructional design.

Green et al. (2020) note that the rapid transition to a fully online mode has challenged even the most experienced educators by requiring them to quickly redesign their courses they had prepared to fit the new mode with new tools. Adedoyin & Soykan (2020) suggest that the migration process should be viewed from the students' and educators' level of digital competence. Digital competence of teachers and students is perceived as an area in need of development for quality online learning and teaching (Adedoyin & Soykan, 2020; Scully et al., 2020). Another challenge experienced by teachers was student engagement (Dreamson, 2020). Ewing & Cooper (2021) revealed that engagement for teachers during emergency remote teaching took central priority over curriculum. However, engagement was their greatest challenge. Makamure and Tsakeni (2020) indicated that teachers teaching science, technology, engineering, and mathematics (STEM) subjects had some pedagogical challenges during online instruction, such as implementing activities that needed hands-on practice, which made online platforms more teacher-centered than face-to-face learning. Furthermore, teachers faced challenges such as converting course materials into the online platform (Dreamson, 2020; Makamure & Tsakeni, 2020). Students also felt some challenges, such as technological limitations and socioeconomic status (Adedoyin & Soykan, 2020), losing hands-on activities (Ramlo, 2021), feeling it was hard to stay motivated (Ewing & Cooper, 2021) and decreased engagement and interaction with peers (Ewing & Cooper, 2021; Ramlo, 2021).

On the other hand, Baptista et al. (2020) revealed that students' knowledge of digital technologies improved and the integration of knowledge between technology and science was activated. Besides, students developed autonomy and self-directed learning skills during the pandemic (Baptista et al., 2020; Penn & Mavuru, 2020). Students also expressed some other opportunities, such as flexibility (Makamure & Tsakeni, 2020; Ramlo, 2021), continuity of learning and teaching (Scully et al., 2021) and cost-effectiveness (Penn & Mavuru, 2020).

Martins (2021) stated that the pandemic has forced institutions, students, teachers, and designers to rethink the usual protocols (p.104) and suggested the pandemic will challenge long-established practices in teaching and designing. Dreamson (2020) noted that the worldwide pandemic has changed the landscape of design education by accelerating its transition to online education. Online education presents a particular challenge for design education, referred to as one of the most resistant disciplines to fundamental pedagogical change (Brown, 2020). Yorgancioglu (2020) discussed the three fundamental changes that design studio pedagogy faced during online education. The surface features of a design studio, which were a shared space through social interactions, were replaced by virtual design platforms. Besides the change in surface features, the pedagogical forms of design studios have also differed by generating changes in the pedagogical roles of students and educators, the way they interact, as well as the methods and practices. Furthermore, the epistemological principles of design studios have varied during the pandemic. It is now considered critical to identify the challenges and potential of both types of teaching, as well as to develop a new approach for post-pandemic design education (Yorgancioglu, 2020).

Ioannou (2017) stated that many design students and practitioners believe that online design education could be ineffective since design education is traditionally a studio-based discipline and online education lacks direct social interaction. In another study implemented before the pandemic by Fleischmann (2020a), it was revealed that 75% of the students would not prefer to

study the design subject fully online for reasons such as lack of face-to-face interaction and the nature of design education requiring immediate feedback and dialogical learning.

Marshalsey and Sclater (2020) noted that the move to online design education has become a testing experience for all parties involved. Studies examining the effectiveness of online design education and the perceptions of teachers and students during the pandemic have been conducted. Fleischmann (2020b) investigated how higher education design students and educators responded to online design education resulting from the pandemic and revealed that most of the students were content with online design education, yet they experienced some challenges, such as lack of motivation and peer interaction, and difficulty in collaborating in group projects. Educators complained about a lack of communication and participation. They also believed online design courses were limited in teaching skills that required tactile sense and actual hands-on practice. In a similar study done by Dilmac (2020), the challenges and opportunities experienced by undergraduate students in online art and design courses were unearthed. The challenges were lack of practice, instant feedback, motivation, and interaction, whereas the opportunities were flexibility of time and place, more samples and resources, increased interest, reduced spending on the lesson, more comprehensible lessons, and increased responsibility for learners. In another study conducted by Marshalsey & Sclater (2020), it was revealed that students found it hard to convey creative ideas and physical prototyping online and that online design education prevented them from achieving their artistic goals. Furthermore, Iranmanesh & Onur's (2021) study indicates significant improvements in students' computer-aided design skills and their ability to conduct independent research, yet the results show a considerable decline in informal peer learning among students.

Up until now, design education studies have primarily focused on higher education (Dilmac, 2020; Fleischmann, 2020b; Iranmanesh & Onur, 2021; Marshalsey & Sclater, 2020). Departing from the dearth of studies in elementary design education, this study will depict the experiences of elementary teachers collaboratively working on supporting design practices before and during the pandemic. To achieve this goal, we will investigate eight teachers' eTwinning experiences that took place in two different years.

Central Concepts Focused in eTwinning Projects

eTwinning is a free platform for European teachers. eTwinning network has almost one million teachers and more than 200,000 schools. Teachers can create their own projects and search for partners, or they can also join projects in other countries (https://www.etwinning.net). eTwinning projects in this study were created by a core group of teachers actively using the eTwinning network for creating joint projects.

The eTwinning projects in this study focused on three central concepts: interdisciplinary thinking, problem solving, and computational thinking. In both projects, students were required to complete the design process using interdisciplinary connections. Interdisciplinary thinking equips students with the knowledge and skills to see the world through multiple lenses, view the connections among disciplines, synthesize knowledge from different disciplines, transfer knowledge and skills acquired in one field to another, and develop multiple points of view (Cotantino et al., 2010; Styron, 2013). Ashby and Exter (2019) believe that integrating

interdisciplinarity thinking into the curriculum allows students to address problems and find solutions by implementing knowledge and skills from multiple disciplines. Furthermore, through the use of interdisciplinary thinking, students may develop critical thinking by evaluating and synthesizing disciplinary knowledge, problem solving, creative thinking, as well as collaboration and communication skills (Cowden & Santiago, 2016; Styron, 2013).

The role of interdisciplinary thinking is underlined in different design education studies (Nae, 2017; Self et al., 2019) and recent reports continue to underline the growing interest in K-12 design education (National Academies of Sciences, Engineering & Medicine [NASEM], 2019). In this study, our main goal was to investigate interdisciplinary thinking in the design process for elementary teachers and students. To achieve this goal, we put the design process and student inquiry at the center (NASEM, 2019) and provided different problems for students. Li et al. (2016) found that the design process supports elementary students' problem solving skills. Connected with this, Lie et al. (2019) stated that the design process starts with finding the problem.

Teachers also focused on computational thinking to scaffold problem solving. As stated by Hsu et al. (2018), computational thinking helps identifying and defining the problem when students are engaged in problem solving. More importantly, Bocconi et al. (2016) stressed the link between design and computational thinking, observing that European countries are still searching for ways to include computational thinking in compulsory education. The projects created in this study present the continuum of including design in K-12 education with an emphasis on computational thinking (Bocconi et al., 2016) and problem solving (NASEM, 2019).

The projects in this study were created from a book that aimed to support the interdisciplinary thinking and design process starting in elementary grades (Gulbahar et al., 2020). *Supporting Computational Thinking with an Interdisciplinary Approach* was supported by the Turkish Ministry of National Education and Google. The book presents different design projects for elementary teachers with an interdisciplinary approach. Teachers created two eTwinning projects by using the examples presented in the book. The activities in both projects supported students' problem solving and computational thinking by connecting what they are learning in different disciplines/courses.

Planning eTwinning Projects with Elementary Teachers

The first eTwinning project (Saving the World) was implemented with second grade students. This project included face-to-face activities because it began before the pandemic. The activities of this project aimed at achieving a clean future. Throughout the project, students conducted research on water sources (e.g. calculating how the amount of water has changed in the last 50 years) and jobs of the future. They were asked to write stories about pollution and design a project to create ecological homes by using compost materials.

Students worked on the following problem before the pandemic: *What can we do to have a cleaner planet in the future?* The goal of this project was to emphasize recycling for students. During this project, students explored the jobs of the future by making connections to Life Sciences. They did research about recycling technologies and created sketches for their ecological homes (see Figure 1).

Figure 1. Sample student sketches before the pandemic

After creating the sketches, students completed their ecological homes by using compost materials (see Figure 2).

Figure 2. Sample student design products for Ecological Homes (Ekolojik Evler) before the pandemic

During the pandemic, the same group of teachers created another eTwinning project called Super Healthy Kids. These teachers continued to work with the same group of students and the activities were planned for third grade students. Third grade activities included students discussing the meaning of healthy habits in different countries. Students also conducted

research on healthy food, created shopping carts and planned their budgets. Students calculated the price of a meal in different countries (see Figure 3) and they used Scratch to design a healthy habit game (see Figure 4). During the pandemic, teachers primarily organized computer-based activities in the design process. All the students participating in this study had computers in their homes, and they did not have any issues related to accessing the Internet. When creating healthy plates, students used the fruits they had in their homes.

During the pandemic, teachers continued to support the design process. Students worked on the following problem: What can you do to have a healthy body? When working on this problem, students started exploring their healthy habits (Life Sciences). In this project, students used math to calculate the price of each healthy meal (see Figure 3).

Figure 3. Calculating the price of a meal (adding the cost of each ingredient to cook spinach)

Students also created healthy plates, made shopping lists and used Scratch to design a healthy habit game (see Figure 4).

Figure 4. Sample student design products during the pandemic

Aim of the Study

The nature of eTwinning projects is online (Gajek, 2018), but the pandemic forced teachers and students to complete these projects entirely online, with no face-to-face interaction. In this process, it is crucial to understand how these interactions have an impact on completing the design process. Our main goal in this study was to understand how the pandemic influenced activity planning, design process, teacher connections, and in-class interactions from the teachers' viewpoint. Connected with this goal, we examined the following research questions:

1) How did the teachers create activities in eTwinning projects before and during the pandemic?
2) How did the pandemic influence the interdisciplinary connections in student design projects?
3) How did the pandemic influence interactions among teachers during eTwinning projects?
4) How did the pandemic influence in-class interactions before and during the pandemic?

Method

We employed a case study in this research. As Yin (2018) underlined, case study methodology enables the researchers to answer how and why questions in tracing of operational processes over time (p. 44). Yin (2018) also stated that case studies can be structured in a comparative way. Connected with this, we created a case study in which participants can compare their experiences by working with the same group of teachers in two different years. In the first year, the year before pandemic, teachers conducted an eTwinning project called Saving the World. In the second year, the year during pandemic, teachers created another eTwinning Project called Super Healthy Kids. Our case study included participants who were involved in both projects to explore and compare the similarities and differences in these two projects with an emphasis on activity planning, design process, teacher connections and in-class interactions.

Super Healthy Kids eTwinning project was completed with 12 elementary teachers. Eight of these teachers were Turkish, and we focused on these teachers' experiences before and during the pandemic, since they worked together for two years. Two Bulgarian teachers and two Portuguese teachers were not involved in the former eTwinning Project; however, they collaboratively worked with the Turkish teachers to complete the latter project during the pandemic. We only collected data from Turkish teachers since the main aim was to investigate how the same group of teachers were influenced by the pandemic. We asked participants to compare their experiences before and during the pandemic.

Data were collected through an interview form prepared by the researchers. A total of twenty questions were prepared. Two experts who specialized in Curriculum and Instruction presented their opinions on the draft form and the final interview form included 17 questions. In the first part of the form, the first question asked teachers to discuss the similarities and differences in their design practices before and during the pandemic. Then, teachers responded to six questions requiring them to rank the interdisciplinary connections in student design projects, interaction among teachers, and in-class interactions before and during the pandemic. All these rankings provided a scale from 1 (no interdisciplinary connections, weak teacher connections,

weak in-class interactions) to 10 (strong interdisciplinary connections, strong teacher connections, strong in-class interactions). Teachers provided their own understanding in these rankings. Also, five questions were asked in the second and third part of the interview form, with the former focusing on the pre-pandemic project and the latter during the pandemic project. Part two and three included questions about choosing a sample student design product presenting interdisciplinary thinking, what teachers did to support the design process and interdisciplinary thinking among teachers, and what teachers did to improve the design process and interdisciplinary thinking for their students.

Descriptive and content analysis were performed for analyzing the open ended questions in the interview. Descriptive analysis is employed when the data is organized and presented according to the themes which emerge out of the research questions. The themes are usually concealed in the research questions or developed in the researcher's mind during the research process (Denscombe, 2007). Content analysis refers to any qualitative data analysis to find similarities and differences to create themes (Patton, 2002). In the first step of the analysis, the authors (1st and 2nd author) used descriptive analysis by rereading the data to get a general understanding of the data. Then, both authors used content analysis and coded the data independently. The creation of themes, sub-themes and codes involved a balance of deductive coding (derived from the philosophical framework) and inductive coding (themes emerging from participants' discussions) (Fereday & Muir-Cochrane, 2006, p.91). Both authors compared their codes and organized several meetings to resolve all disagreements until they achieved 100% inter-coder reliability (Miles & Huberman, 1994). As a result of this comparative analysis, a total of 34 codes were created and these codes were categorized under four themes. Each theme also has two sub-themes to present the changes in different eTwinning projects: before and during the pandemic. All themes (activity planning, design process, teacher-teacher connections, in-class interactions), sub-themes (before the pandemic, during the pandemic) and codes are presented under each research question under the findings section.

All the questions were reviewed by the Ethics Committee before conducting the interviews. Ethical permission was obtained from the Usak University Ethics Committee (Decision #2021-09). In order to protect the privacy of the participants, each teacher was represented by a code such as T1, T2. When selecting the design examples from students, we only included students whose parents gave permission to be part of the study. We removed student identifiers from the sample design products.

Findings

Findings are presented in line with the research questions and under each research question we have added a list of themes, sub-themes, and codes.

Research Question (RQ) 1. How did the teachers create interdisciplinary activities in eTwinning projects before and during the pandemic?

The findings related to RQ1 are presented under the activity planning theme. This theme has two sub-themes (before and during the pandemic). This is the only theme that we did not find changes in codes between sub-themes (see Table 1).

Table 1. Sub-themes and codes for activity planning

Theme	Sub-themes	Codes
Activity planning	Before the pandemic	-Emphasis on problem-solving -Emphasis on inquiry -Emphasis on computational thinking -Emphasis on interdisciplinary connections
	During the pandemic	-Emphasis on problem-solving -Emphasis on inquiry -Emphasis on computational thinking -Emphasis on interdisciplinary connections

Before the Pandemic

Teachers started planning their activities by placing problem solving and inquiry at the center:

> *"Students solved a problem by conducting research." (T4)*

Activities before the pandemic also emphasized interdisciplinary connections and computational thinking. For instance, one of the teachers (T8) discussed the importance of making connections between different disciplines to support students before the pandemic:

> *"We were trying to develop thinking skills by connecting with the knowledge in different lessons we had learned before." (T8)*

Another teacher (T2) summarized these connections before the pandemic as:

> *"There was usually reading involved in the introduction part of lesson plans that was linked to the goals of language classes. Environmental and conservation awareness were linked to the goals of science classes. Including measurements was connected with the mathematics classes. International children's day activities were associated with the music classes, and designing a time machine was connected with the visual arts classes." (T2)*

Teachers also stated the emphasis on computational thinking before the pandemic. T4 stated this as

> *"The importance of technology in accessing information for computational thinking skills was covered." (T4)*

During the Pandemic

Activity planning continued in the same mindset during the pandemic. One of the teachers (T4) stated that:

> *"Activities were planned to enable students to engage in problem solving and inquiry. We created links between the learning gains and most lessons in order to help students reach an understanding by solving thinking problems." (T4)*

Another teacher (T8) added the following about the interdisciplinary connections during the pandemic:

> *"We tried to show different ways of thinking by associating Science with Mathematics and other courses." (T8)*

T3 discussed the importance of computational thinking as

> *"It was ensured that students integrate their computational thinking skills into the lessons." (T3)*

To summarize, teachers' interdisciplinary activity planning was always at the center during the pandemic:

> *"Since our school is an International Baccalaureate school, we already planned the units with interdisciplinary connections. We continued the process by integrating eTwinning projects into the units." (T5)*

When creating these activities, teachers used an existing book to start their eTwinning projects (Gulbahar et al., 2020), but they also created two e-books for these projects. Looking at the sample e-book created during the pandemic (Super Healthy Kids, 2020), we can see that teachers are capable of creating learning environments supporting interdisciplinary thinking, problem solving, and computational thinking. The pandemic did not create a change in activity planning or structure for teachers. Teachers continued to create activities with the same mindset before and during the pandemic.

RQ 2. How did the pandemic influence the interdisciplinary connections in student design projects?

Table 2 presents the sub-themes and codes for the design process. In this section, we will discuss how the change in teacher support influenced student design products.

Table 2. Sub-themes and codes for design process

Theme	Sub-themes	Codes
Design process	Before the pandemic	-In-class design environment -More effective control mechanism -More effective feedback -More interdisciplinary connections in student design products
	During the pandemic	-Support through online meetings -Lower interdisciplinary thinking in student design products -Lower creativity -Lower attention period -Teacher adaptation to online teaching -Less time allocated for project -Individual design process

Before the Pandemic

Teachers' responses presented a broader support mechanism that emphasized different aspects of the design process before the pandemic. Several teachers stated that a support mechanism was created inside the classroom. One of the teachers created (T6) in-class design environments and another teacher (T7) organized design workshops.

Another important idea emerging from teacher interviews was the importance of the control mechanism:

> *"We operated control mechanisms throughout the design process. Giving feedback throughout the process supported students." (T1)*

T3 also added the importance of feedback mechanisms:

> *"We were more effective at student monitoring and follow-up during face-to-face education." (T3)*

The main difference teachers underlined before the pandemic was the role of teachers in supporting the design process:

> *"We (teachers) were providing an idea of how to progress (in the design process) while the work was being done." (T4)*

T8 reiterated this idea by stating:

> *"We were examining the sample products created before starting the design. We decided what we could do by explaining the work we would do. We were giving an idea about how to proceed while the work was being done and we were completing the design process." (T8)*

Teachers addressed in-class design environments, feedback and control mechanisms only in the eTwinning project conducted before the pandemic. These aspects had an influence on the student outcomes. T8 stated that the interdisciplinary connections were stronger in student design products before the pandemic. Figure 5 presents that four teachers provided a higher score and three teachers provided the same score when ranking the interdisciplinary connections in student design products before the pandemic. On the other hand, one teacher provided a higher ranking for the interdisciplinary connections in student design products during the pandemic.

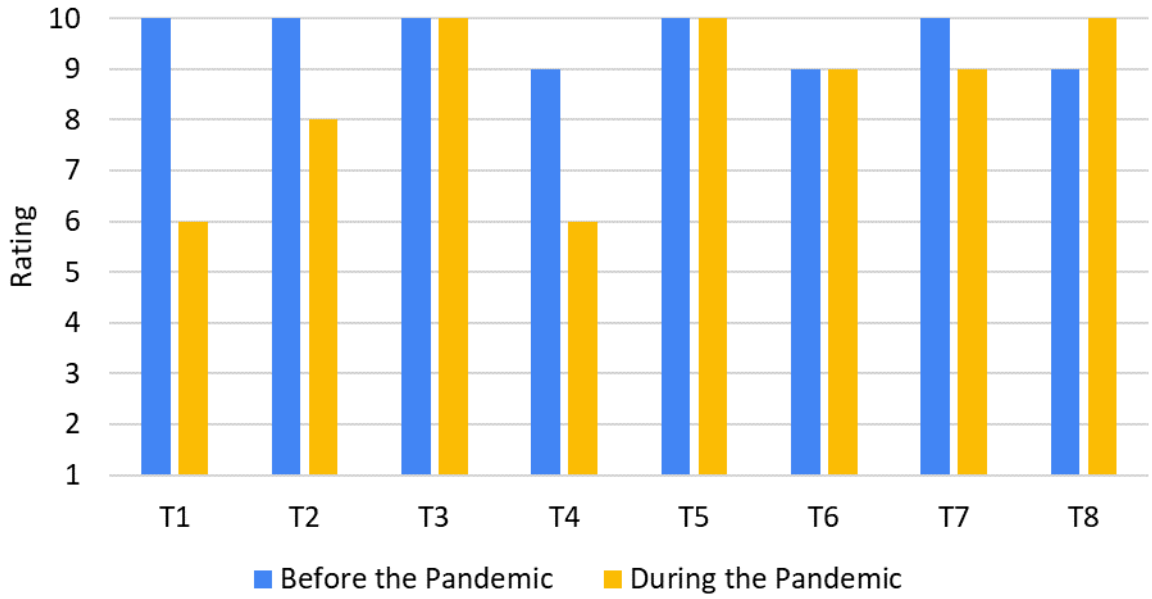

Figure 5. Each teacher's rating for interdisciplinary thinking in student design products (1: no interdisciplinary connections, 10: strong interdisciplinary connections).

During the Pandemic

Both eTwinning projects emphasized the design process and the design process was influenced by the pandemic. During the pandemic, teachers organized online meetings (T7 & T8) with their students and used different online tools:

> *"We provided information about the design process through showing similar examples in live lessons and through WhatsApp groups." (T1)*

Another teacher (T2) introduced Web 2.0 tools, and more specifically, the Canva platform was used to create a common design language (T6).

Students were engaged with the design process in two different years, but the pandemic had a negative influence on the interdisciplinary connections in student design products:

> *"While our students were more successful in interdisciplinary studies during face-to-face training before the pandemic, the success rate decreased during the pandemic." (T1)*

Further, detailed investigation of the codes emerging from the qualitative analysis identifies several reasons for this change.

The first reason stated by the teachers was a lack of creativity. T1 stated,

> *"I think being on the screen constantly causes their creativity to decrease." (T1)*

Connected with this, another teacher also added that

> *"The brainstorming step was missing during the design process." (T6)*

The second reason was the decreased attention of students:

> *"In online education, it has become a little difficult for students to make connections in designs, depending on their attention." (T8)*

The third reason was teachers' lack of adaptation to the completely online learning environment:

> *"I could not guide students as productively as I did in the face-to-face classes during the design process." (T8)*

The fourth reason was the decreased time given for completing the project:

> *"The time we allocated to the project in the live lessons decreased a little." (T2)*

The last reason was the individual design process:

> *"We planned more individual studies appropriate for distance education." (T3)*

RQ 3. How did the pandemic influence interactions among teachers during eTwinning projects?

Table 3 presents the codes for the teacher-teacher connections theme. This section discussed connections among project members and included other connections teachers stated during the interviews.

Table 3. Sub-themes and codes for teacher-teacher connections

Theme	Sub-themes	Codes
Teacher-Teacher connections	Before the pandemic	-Online meetings among project members -More frequent meetings among project members -Additional collaboration among project members in the same school -Support from teachers working in other disciplines - Additional face to face meetings
	During the pandemic	-Continuity of online meetings among project members -Support from other teachers working in other disciplines -Less connection among teachers in the same school

Before the Pandemic

The nature of the eTwinning projects requires teachers to create online collaborations with other teachers. Before the pandemic, teachers used WhatsApp and organized webinars. When comparing their experiences, T3 stated the frequency of meetings before the pandemic:

> *"We were having more frequent meetings among teachers. We continued our work with the 5E model joint planning." (T3)*

In addition to the frequent meetings among project members, teachers also created additional collaborations that could take place inside the school between teachers before the pandemic. T2 underlined this idea by stating the continuous discussions happening in the teachers' room.

Teachers also received support from teachers from other disciplines:

> *"Before the pandemic, we asked for help from our teachers in other disciplines when we needed it." (T8)*

Finally, several teachers (T6 and T7) also stated that additional face-to-face meetings were helpful for them in the design process. As presented in Figure 6, four teachers provided a lower ranking for their experience during the pandemic, with an emphasis on teacher connections. On the other hand, the remaining four teachers provided the same score when comparing teacher connections.

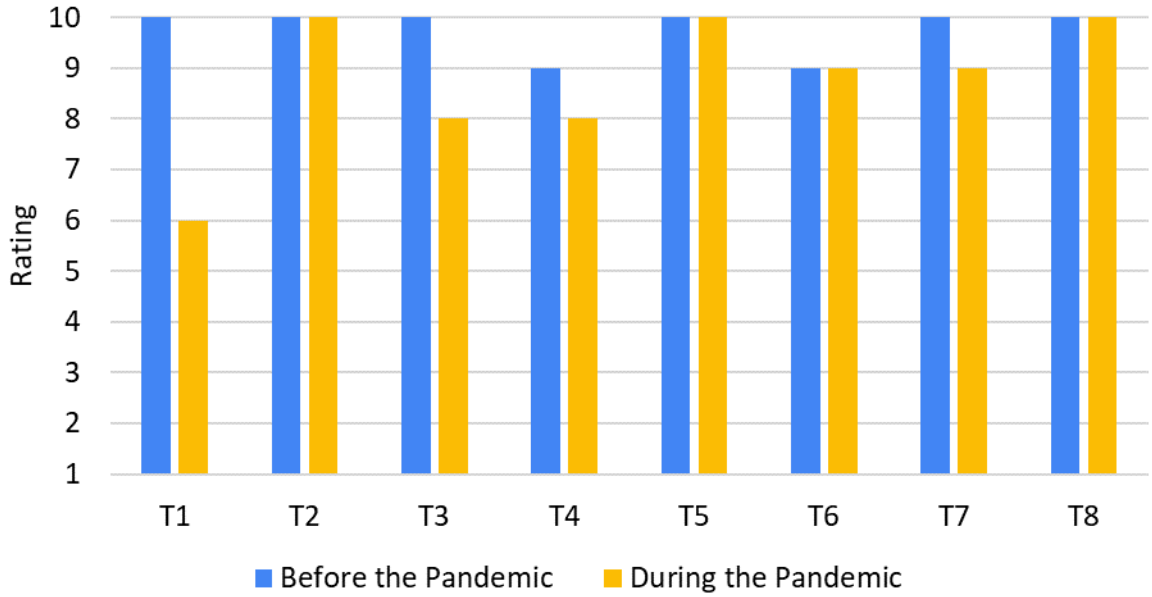

Figure 6. Each Teacher's Rating for Teacher Connections Before and During the Pandemic (1: weak teacher connections, 10: strong teacher connections)

During the Pandemic

During the pandemic, teachers continued their online meetings:

> *"We communicated through webinars, chatroom conversations, and WhatsApp calls." (T8)*

Teachers' planning during these online meetings continued in relation to the project tasks:

> *"In online meetings, we divided the groupwork and collaborated on e-book writing and creating videos." (T7)*

It is important to underline that teachers also continued to collaborate with teachers from other disciplines during the pandemic:

> *"In order to use the Scratch program, we got support from the Information Technology teachers. For foreign languages, we got support from our English teacher." (T8)*

Teacher 8 added that this communication was related to fulfilling the project duties:

> *"By participating in the meetings, we supported the use of the Scratch program by fulfilling our duties of writing e-books and creating videos." (T8)*

As stated in the previous section, the frequency of meetings has changed during the pandemic. In addition to missing additional face-to-face meetings with project members, teachers also stated a decreased connection with their colleagues working at the same school:

> *"We used to exchange ideas with our project friends at school during the breaks." (T5)*

RQ 4. How did the pandemic influence in-class interactions before and during the pandemic?

Table 4 presents the codes for in-class interactions. In this section, we will discuss how in-class communication was facilitated before and during the pandemic.

Table 4. Sub-Themes and Codes for In-Class Interactions

Theme	Sub-themes	Codes
In-class interactions	Before the pandemic	-More teacher-student communication -Easy to assist students -Importance of group work
	During the pandemic	-Less teacher-student communication -Lack of group work -Increased parental involvement -Increased use of digital tools

Before the Pandemic

Teachers stated that face-to-face classes created more opportunities for in-class interactions:

> *"Before the pandemic, being together with my students in the classroom was more efficient in terms of communication. There was a better environment in terms of directing them and sharing ideas with each other." (T2)*

The idea of assisting students was also underlined by other teachers:

> *"We carried out the activities face to face in the classroom environment. I tried to support them when they struggled." (T5)*

Connected with this, T8 also underlined that guiding students was easier before the pandemic.

Finally, T5 stated the importance of collaborative learning. T3 also stated that:

> *"Face-to-face education increased group interaction and supported collaborative work." (T3)*

To add to this idea, T6 and T7 stated that they organized activities supporting group work. Another teacher reiterated this idea by describing how group participation helped students advance their ideas:

> *"It was easier for students to bring together the knowledge and skills that could shed light on the problem or subject from different aspects before the pandemic." (T4)*

Figure 7 presents each teacher's ranking for in class interactions. This is the aspect where we observed the biggest difference in teacher ratings. Six out of eight teachers provided a lower ranking for in-class interactions during the pandemic. Two teachers provided the same score when comparing in-class interactions.

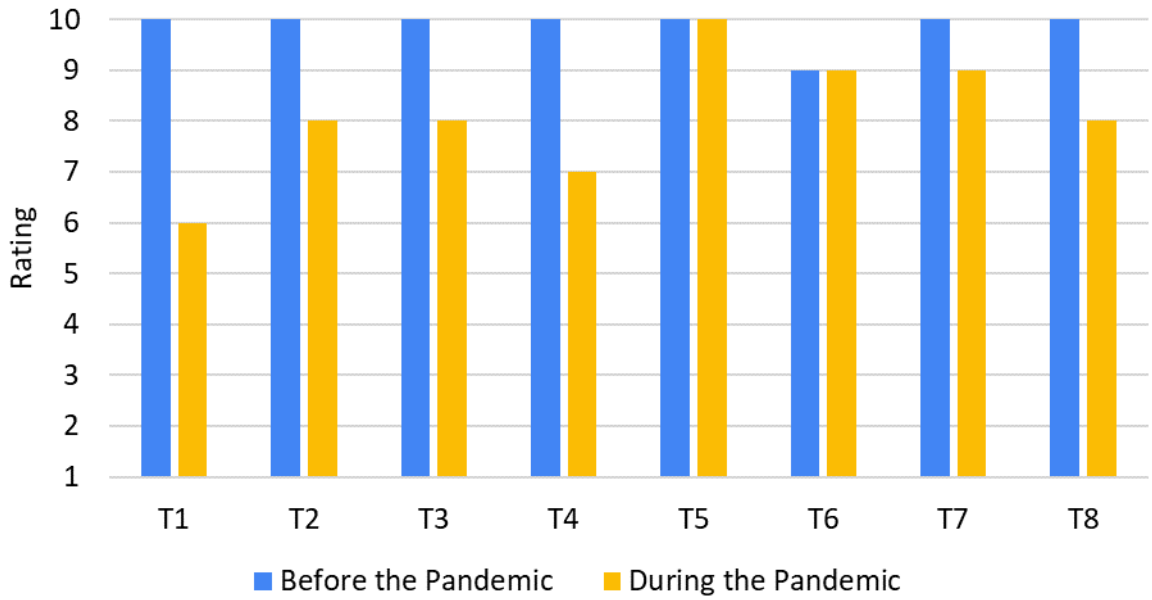

Figure 7. Each Teacher's Rating for In-class Interactions Before and During the Pandemic (1: weak in-class interactions, 10: strong in-class interactions)

During the Pandemic

T8 stated that communication between teachers and students decreased during the pandemic. Another result emerging from the challenges faced during the pandemic was the lack of participation in group activities. T3 stated that this was the main difference between the two eTwinning projects:

> *"This process (the pandemic) just affected the groupwork, the activities were individual." (T4)*

This underlined that missing the contribution of group activities had a negative impact on collaborative learning. Overall, teachers stressed the fact that in-class interactions decreased during the pandemic. To overcome this challenge, one teacher contacted the parents:

> *"We communicated with the children through the parents, and this led students to expect everything on a silver plate." (T2)*

During the pandemic, teachers relied on using online tools (T4, T6 and T7) to communicate with their students. T2 stated that students' increased use of digital tools had a positive outcome for students:

> *"Students made progress in using Web2.0 tools during the pandemic period." (T2)*

Discussion

Design is an interdisciplinary practice (Nae, 2017; Self et al., 2019). In an earlier study of engineering education, Hirsch et al. (2001) prepared an interdisciplinary design project. This idea has been transferred to K-12 education and Chiang et al. (2020) created interdisciplinary activities for elementary students. When supporting design in elementary grades, Chiang et al. underlined the importance of problem solving. In our study, teachers created activities supporting interdisciplinary thinking and problem solving. Teachers' activity planning also made connections with computational thinking to increase the efforts to support computational thinking in compulsory education (Bocconi et al., 2016).

As stated by the Next Generation Science Standard (NGSS, 2013), the design process starts with a problem and continues with designing and testing solutions. In both eTwinning projects, teachers gave different problem situations (What can we do to have a cleaner planet in the future? What can you do to have a healthy body?) Students were engaged in creating their own design products to solve these problems. Engaging students in the design process at the elementary level continues to receive attention from recent studies (Dickes et al., 2020; Jocius et al., 2020). However, it is important to underline that completing this process would be challenging in the elementary grades for teachers (Mangiante et al., 2020; Tank et al., 2020; Yang et al., 2020). The pandemic added another layer to these challenges by influencing the level of support teachers provided during the design process. Teachers stated that during the pandemic, their control of the design process decreased when supporting students' design process to give feedback. Testing solutions in the design process (NGSS, 2013) is a vital step in improving design products. Unfortunately, teachers could not support that aspect in a way they did before the pandemic.

Completing the design process at the elementary level does require scaffolding provided by the teachers, and elementary teachers might need support from other teachers. For instance, Tank et al. (2020) asked elementary teachers to collaborate with student teachers and engineering students. Similarly, Pleasants et al. (2020) also teamed elementary teachers with engineering students. In a regular implementation, it might not be possible to team elementary teachers with experts in the field. Another potential support mechanism in the design process is to seek help from peers by making collaborations with other teachers (Capobianco & Rupp, 2014). Teachers also help each other during the activity planning (Guzey et al., 2016; McFadden & Roehrig, 2017) to support the design process. In the current study, teachers stated that they had frequent meetings before the pandemic with their colleagues. The pandemic did create a decrease in the number of these meetings and also limited the additional connections teachers would make with their colleagues working in the same school.

In an eTwinning project engaging with project-based learning to design games in a computer science lesson, Gulmez (2018) revealed that students considered the project as an opportunity to collaborate, communicate with peers from different countries, and see their mistakes by getting feedback from their classmates. In addition, Fleischmann (2020b) argues that design is a collaborative process and sharing design ideas with peers and teachers is a critical element of studio-based design education. However, as also revealed in the current study, the pandemic made the social aspect of the design process difficult to handle. When comparing two different eTwinning projects, the teachers presented the biggest differences in the in-class interactions.

In the design process, it is important to support students working in teams (Gillespie Rouse & Rouse, 2019; Siverling et al., 2019). Elementary teachers stated the lack of groupwork during the pandemic and activities became individual tasks for each student.

Conclusion

As stated by several studies, understanding how to support design practices online will be a test for the field (Marshalsey & Sclater, 2020; Martins, 2021) and previous studies have presented examples from higher education (Dilmac, 2020; Fleischmann, 2020b; Iranmanesh & Onur, 2021; Marshalsey & Sclater, 2020). In this study, our goal was to understand how these examples were translated into elementary education. Although eTwinning projects support distance learning experiences (Gajek, 2018), our case study with the same group of teachers revealed that shifting these projects to a completely online learning environment had some consequences for the design process. The first one was related to missing additional opportunities for teachers to guide students through the design process. Previously, Yorgancioglu (2020) underlined that making design an online process may lose shared space when engaging in design. When elementary teachers could not work collaboratively in a shared space (creating in-class design environments, working with their colleagues in the same school), design became an individual process for students. Supporting collaborative groupwork in online education is a challenge in higher education (Fleischmann, 2020b), and it has also become a challenge for elementary teachers. In this process, students also need instant feedback to improve their designs (Dilmac, 2020; Dreamson, 2020) and teachers discussed how they could provide feedback more frequently before the pandemic when activities were conducted face to face. The pandemic created challenges, but it also presented room for improvement since students spent more time with digital tools. Connected with the studies conducted in higher education (Baptista et al., 2020; Iranmanesh & Onur, 2021), one of the teachers in this study also underlined the improvements students made in using Web 2.0 tools.

In the current study, teachers' activity planning remained the same before and during the pandemic. The pandemic had an influence on teachers' implementation, but it is important to underline that our case included a limited number of elementary teachers engaging their students in the design process through eTwinning projects. Our goal was to compare the same group of teachers. We could not add an international viewpoint from other countries. We only presented the influence of the pandemic from the teachers' viewpoint. Therefore, no general conclusions can be drawn about how these changes would also influence teachers' practices or students' ideas in other classes. Future studies may add comparisons across countries by including different student groups to get a better understanding of the pandemic's influence on design education and eTwinning projects.

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An Administrative and Faculty Autoethnographic Analysis of Shifting Modalities of Pre-service Technology Education Programming during the Onset of COVID-19

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Abstract
The COVID-19 pandemic has disrupted our collective normal patterns of behavior in almost all aspects of our personal and professional lives. While many K-12 and post-secondary subject area curricula lend themselves more easily to a migration to online and remote learning, technology education faces unique challenges. This research paper sought to understand the challenges, benefits, and lessons learned through an analysis of the process of re-organizing a pre-service technology education diploma for remote, blended, and face-to-face learning during the early stages of the COVID-19 pandemic. The investigation followed a collaborative autoethnographic methodology as the authors constructed two narratives based on their roles of administering and instructing in a pre-service technology education diploma program. An interpretive descriptive analysis suggests a number of challenges associated with the organizational changes, but also a number of positive outcomes related to the instructional shifts. Challenges included maintaining equitable access to physical materials and technologies for all students, scheduling issues related to changing pandemic rules and regulations, and a loss of social presence with students. Benefits included more student autonomy, less dependence on group work for technical skill development, and the development of alternative delivery models for pre-service technology education that could be used to expand program offerings to non-traditional students.

Keywords
faculty perceptions of COVID-19, pre-service teacher education, technology education, COVID-19, autoethnography

Introduction
The COVID-19 pandemic has disrupted our collective normal patterns of behavior in almost all aspects of our personal and professional lives. While many K-12 and post-secondary subject area curricula lend themselves more easily to a migration to online and remote learning, technology education faces unique challenges. Access to course-specific materials and hardware paired with the range of personal devices used for remote learning has certainly been a learning curve for both pre-service teachers, course instructors, and administrators.

Technical activity at the foundation of technology education has traditionally been delivered in a face-to-face environment. Technology education adopts an epistemological perspective where knowledge is created through dialogic interaction between co-participants while

engaging with tools, materials, and processes. It builds upon constructivism through an emphasis on the production of an external artifact of knowledge. As a result, Technology Education can be situated along a spectrum of established epistemologies as an example of constructionism.

Each year's technology education diploma program cohort forms a community engaged in similar activity where relationships are formed and built into support structures. Within the traditional context, technical skill development is supported by program instructors and pre-service classmates in real time. Troubleshooting problems and timely support have become foundational constructs to assist pre-service teachers in understanding technology education and internalizing their own sense of best practice pedagogies. The COVID-19 pandemic and the transition towards remote delivery of technology courses within the technology education pre-service program changed the established model.

As institutions attempted to move forward remotely in their offerings, courses grounded in technology education required special consideration and planning to transition towards a more virtual pedagogy. Instructors with experience delivering technical courses know that effective pedagogical strategies rest upon the creation of routines, routines that need revisioning to reflect a change in the delivery medium. The following study is placed at the crossroads of an instructional shift forced by the COVID-19 pandemic but might hold potential for remote offerings of technical courses in future deliveries of technology education pre-service programs.

Literature Review

The COVID-19 pandemic has caused an unprecedented wholesale shift to remote and online learning within educational institutions around the globe. Within days of learning of public health restrictions, post-secondary institutions reacted en masse by postponing, cancelling, and transitioning courses to remote or online instruction. A comparable response was also felt at the K-12 level but the scope of this work remains centered on post-secondary. The lead time of responses varied from a few days to a few weeks (Day et al., 2021), but the administrative outcomes were virtually identical. While the transition allowed institutions to maintain classes and credential completion there were many inequitable challenges for students and faculty (Day et al., 2021). Of particular interest for this study is the reported inequity in the availability of practical, experiential, and hands-on experiences that are the cornerstone of many programs and disciplines (Day et al., 2021; Doreleyers & Knighton, 2020). Doreleyers and Knighton (2020) reported that service, trades, and health care programs saw the highest level of course and program postponements and cancellations during the beginning of the pandemic within the post-secondary context. They speculated that the applied and practical nature of these programs accounted for the findings, as institutions struggled to find ways to replicate these experiences in a remote or online medium. Day et al's (2021) study also supported this finding as they reported on issues related to maintaining the experiential and field-work portions of six geography programs across three countries. Specifically, they found that students and faculty both struggled to maintain a community presence and that inequalities in students' access to technology, lack of quiet study space, and economic difficulty degraded their experience and ability to perform to their full potential. These and other themes have become very apparent as faculty and researchers have turned their focus inward on their own experiences throughout the pandemic.

Administratively, the pedagogical shift during the COVID-19 pandemic required a coordinated effort. Aagaard and Earnest's (2021) perspective piece on educational leadership during the pandemic noted the importance of offering timely responses to emerging events, a concept they referred to as “operational tempo” (p.183). Their work highlighted that institutions must communicate the guiding principles (i.e. institutional regulations for course offerings during the COVID-19 pandemic) to inform the decision-making processes of subordinate groups (i.e. Faculties). In turn, the institutional ability to adapt to a disruption such as the global pandemic is a testament to its operational resilience. Butler (2018) described operational resilience to be an organization’s ability to “...anticipate, prepare for, and respond and adapt...” (p.104) to any short-term / long-term disruption. Understanding the complex dependencies associated with shifting towards a new pedagogical model aligns with Butler's (2018) business-model work on being adaptive and flexible. In the end, the development of an effective framework can offer a timely solution for the immediate disruption but also when faced with similar disruptions in the future.

From this brief review of the literature, it is apparent that programs of study that rely heavily on face-to-face, experiential, hands-on engagement were harder hit during the pandemic induced transition to remote and online learning than programs that reside in a more conceptual based paradigm. Moving from this broader picture the local context and background of this technology education pre-service diploma program will be discussed.

Contextual Background

Memorial University’s Faculty of Education offers an eight course diploma in technology education. This diploma is offered conjointly with a second bachelor degree B.Ed. in secondary education. Students enter the program with undergraduate degrees in recognized teachable subject areas within the Newfoundland and Labrador, Canada educational jurisdiction. The technology education diploma gives the students a second teachable and is the credit equivalent of an undergraduate minor. Every spring semester the Faculty admits a new cohort of 20 students into this program, which runs for three consecutive semesters. Curricular content covers everything from philosophy and history of technology education to material processing to computer programming and robotics. Because education is a provincial jurisdiction in Canada, the diploma content is tailored to the local educational needs, but there is still significant overlap with other provincial curricula. Graduates of the program are well prepared to teach technology in many contexts.

Prior to the 2020 global COVID-19 pandemic the primary method of delivering the diploma was a traditional face-to-face design studio setting. The physical location in the Faculty of Education offers a complete design and fabrication suite that is meant to replicate and model the ideal setting for teaching technology within the local education system. Before the outbreak of the pandemic no thought was ever given to the idea of remotely offering our course content, as it had always been assumed that the hands-on nature of the content was best delivered face-to-face. In March of 2020, just two months before accepting our new cohort, these assumptions were strongly questioned. The arrival of the pandemic and subsequent restrictions, lockdowns, and the general halt of day-to-day life as we knew it created a serious challenge for moving forward with the diploma program for the 2020 cohort. Many questions circulated within the first few weeks, including if the diploma could be offered at all. Needless to say, the decision

was made to carry on, but in a modified format. This paper is one effort to rigorously document an unprecedented event in the history of this diploma program and to provide a detailed example of the international effort to maintain high quality pre-service technology education instruction throughout the continuing COVID-19 pandemic.

Purpose

An understanding of the pragmatic experiences associated with the transition of practical course offerings to remote delivery within the technology education diploma program can offer a foundational understanding and lay the groundwork for other institutional efforts to move forward during the COVID-19 pandemic. Timely research focusing on the challenges, benefits, and lessons learned reduces the potential for limited offerings of technical courses to pre-service teachers as the pandemic continues to reduce face-to-face instruction especially in hands-on programming.

The COVID-19 pandemic was the catalyst that triggered the re-organization of the technology education pre-service teacher diploma for remote, blended, and face-to-face learning. The re-design of technical course offerings required a reimagining of the program from both an administrative and an instructional perspective. As such, this study offers a meaningful, pragmatic perspective from participants engaged at the administrative and instructional levels of the program.

Research Question

The main research question that guided this collaborative autoethnographic research was: How did COVID-19 impact the delivery of technical course offerings for pre-service teachers? The following sub-questions were used to support the main question:

- To what extent did COVID-19 impact the delivery of technical offerings from an administrative perspective?
- To what extent did COVID-19 impact the delivery of technical offerings from an instructional perspective?

Methodology

This research study is contextualized within the constructivist qualitative paradigm and used a collaborative autoethnographic methodology. This combination was deemed the most appropriate in understanding the lived experience of two university instructors tasked with administering and teaching in a technology education pre-service teacher diploma program during the early stages of the global COVID-19 pandemic. As Roy and Uekusa (2020) have pointed out, qualitative researchers have found themselves in a quandary during the COVID-19 pandemic as much of their research and methodology relied primarily on face-to-face interactions and immersion into the context of their investigations. While this might be the case for the foreseeable future, they suggested that qualitative researchers look to alternative or underutilized methodologies that will allow them to continue to have access to rich data sources. One such methodology is collaborative autoethnography.

Autoethnography has a long history within sociology and anthropology as it combines elements of auto-biography and ethnography to analyze social phenomena from the perspective of the self rather than the other (Anderson, 2006; Ellis et al., 2011). While this methodology may be rooted in sociology and anthropology it has gained popularity in other social science disciplines, including educational research, over the last number of decades (Anderson, 2006; Roy & Uekusa, 2020). The vast majority of research in the vein of autoethnography has been dominated by the evocative and emotional stream promoted and practiced by Ellis and her peers (Bochner & Ellis, 2016; Ellis, 1999; Ellis et al., 2011; Jones, 2016). While the evocative school may be useful in understanding the viewpoint of a single individual within a social context, it has been criticized for a lack of connection with existing theory and a general lack of scientific rigor (Anderson, 2006; Atkinson, 2006; Méndez, 2013; Walford, 2004). Anderson (2006) has pointed out that evocative autoethnography is only one sub-set of the discipline and that there are others that follow the realist and analytic tradition of ethnographic research. As we endeavored to go beyond a simple self-study and would like to place our experiences of teacher education within the larger context of existing theoretical understandings, Anderson's (2006) analytic autoethnography will be our anchor methodology.

“The self-narrative of analytic autoethnography is used, in part, to develop and refine generalized theoretical understandings of social processes” (Anderson, 2006, p. 385). As such, Anderson's (2006) five point framework for defining an analytic autoethnographic study was used to orient our own work. In general, Anderson (2006) contends that any autoethnographic work should consist of (I) CMR – a complete member of the researched context, (II) analytic reflexivity – the ability to understand the reciprocal influence of the researcher on the study, (III) visible and active research in the text -that the voice and thoughts of the researcher have a prominent place within the study text, (IV) a dialogue with informants that goes beyond the self, and (V) a commitment to an analytic agenda. To expand on Anderson's, (2006) fourth point of dialogue beyond the self, we will also be incorporating elements of collaborative autoethnography (CAE) as defined by Roy and Uekusa (2020).

Collaborative autoethnography (CAE) goes beyond the isolated enactment of autoethnography as it allows multiple collaborators to “... combine their energy and data to create a richer pool of data from multiple sources (Chang et al., 2012, p. 89). Roy and Uekusa (2020) reiterated that there are multiple forms of data collection and analysis available for CAE, including personal memory data, interviews, and the analysis of each other’s self-identities. From a data analysis perspective “a built-in process of internal peer-reviewing starts to form through data collection, analysis and interpretation sessions as the mutual scrutiny, interrogation and probing continues (Roy & Uekusa, 2020, p. 388).

The connection between individual and collaborative autoethnography allows for a balance between the individual and their community of context, thus strengthening the analytical nature of the methodology. As both authors share similar education and research backgrounds, they will be the primary collaborative autoethnographic informants for this study.

A quick check of the criteria above firmly places this study in the collaborative and analytic autoethnographic tradition as both authors:

- are full members of the community of inquiry.
- have undertaken a rigorous analysis of their narratives in a framework of mutual reflexivity.
- have included their own thoughts within the text of the study.
- reached beyond themselves for dialogue.
- have included an analysis of their individual narratives and self-identities.
- are looking for connections with existing theory.

Data Collection Methods

As a collaborative autoethnographic methodology has been adopted as the lens of this inquiry, the primary source of data were self-reflective narratives. While this does coincide with the spirit of the methodology, it is not without its faults. Human memory and recollection have limitations that can skew the facts and are inherently biased towards individuals' viewpoints, opinions, and experiences. Yet it is our own recollections that offer the only avenue for us to understand anything. Therefore, human recollection may be the best we have for understanding our own and others' perceptions of reality. As Audi (2010) pointed out, without memory we would not be able to form perceptions of events at all and that there is a difference in believing something happened and recalling an actual event. In recognizing the inherent strengths and weaknesses of self-reflective narratives other external sources of data to support or refute the recollections in addition to the shared analysis and critique of each narrative were used. For the purpose of this study the external sources of data were exclusively of a written and documented variety. Specifically, pre and post COVID-19 course outlines, occupational health and safety reports, access to campus plans and requests, email correspondence, scheduling drafts, and university news releases were all utilized. These external data sources increased the validity of the self-reflective narratives. In addition to these various data sources the validity of the participants themselves had to be addressed. While everyone may have an opinion, not everyone has the ability to give a qualified one. To again increase the validity of the data, the next section briefly discusses the characteristics of the participants within the context of administering and teaching in the technology education pre-service program.

Participants

Following the collaborative autoethnographic methodology of the study two participants were tasked with developing individual narratives of their experiences related to the sudden shift in the administration and instructional practices of a pre-service technology education diploma program. The narratives were reinforced by a systematic analysis of their self-reflections with artifacts and documents as indicated in the previous section. Below are too brief character descriptions of the participants that illustrates their unique and qualified positions within the context of the study.

Participant 01

David is an Assistant Professor in the Faculty of Education, Memorial University, and the current program coordinator for the Faculty's technology education diploma program. He is a former K-12 technology education teacher with over 15 years' experience teaching in both the K-12 and post-secondary level. In addition to his teaching role, David has six years of informal and formal

administration experience related to the diploma program and therefore has intimate knowledge of the program's internal administration. His combined experiences make him a rich source of data for this study.

Participant 02

Thomas is an Adjunct Professor in the Faculty of Education, Memorial University, teaching as a per-course contractual instructor in the Faculty's technology education program. His technical, face-to-face courses focusing on programming, physical computing, and robotics for pre-service teachers shifted to remote offerings during the COVID-19 pandemic. Thomas has experienced the challenge of re-designing practical course offerings as a program instructor. Outside of his post-secondary commitments, Thomas is also a technology education teacher at Eric G. Lambert School, Churchill Falls, Newfoundland and Labrador. His perspective is based upon pragmatic experience in COVID-19 and pre-COVID-19 course offerings provides valuable insight.

Data Analysis

A process of interpretive description was the primary data analysis method used in this study. Thorne et al. (1997) described the data analysis of interpretive description as moving beyond simple sorting and coding of discrete data chunks that can overwhelm and oversimplify to a more holistic interaction with the data. Repeated immersion in the data prior to coding, classifying, and creating linkages are key for allowing researchers to reach higher levels of synthesis, theorizing and recontextualizing within context (Thorne et al., 1997). Interpretive description requires researchers to become intimately knowledgeable about individual cases in order to abstract relevant themes and knowledge that can be applied back to similar cases (Thorne et al., 1997). For this study the methods of interpretive description were applied to each of the narratives. The common themes and relevant abstractions that emerged from the data were the biases for the theoretical and practical analysis that follow the narratives below.

Findings (Self-reflective Narratives)

As collective autoethnographic studies rely on analyzing self-reflective narratives of participants that are entrenched in the context of the cultural phenomena that is taking place, in this section of the paper two distinct narratives are presented. First from an administrative vantage point and second from an instructional vantage point. In keeping with the collaborative autoethnographic methodology, the narratives form the core of our data, but at the same time, draw on the external sources mentioned in the preceding section.

An Administrative Narrative

By the middle of March 2020, Memorial University was entering into the suspension of most normal public activities due to the arrival of our first cases of COVID-19. While this was later than many other provinces it was only a matter of time before COVID-19 became a reality in Newfoundland and Labrador. With the suspension of all instruction in the K-12 system, post-secondary institutions soon followed suit, with the added caveat that classes would continue, but through online and remote methods. While early news releases from the university made it sound like everything would be fine by moving to an online environment, they did little to recognize, except for medicine, nursing, and pharmacy, the inherent issues of moving programs with significant practical components from their traditional learning spaces to online and remote learning spaces (Newfoundland, 2020). With seven pre-service technology education

courses, spread between two cohorts of 20 students each, scheduled to start a little more than a month away, the sudden restrictions imposed by COVID-19 raised some significant administrative hurdles, the first of which was a clear lack of guidance.

Within the first 24 hours of learning that all on-campus activities would be halted a flurry of activity began to ripple through the university community. Students, professors, staff, and administrators all looked in multiple directions for guidance and from my perspective it became apparent that for the next little while the information and direction would be very fluid. While no actual diploma courses were in session at this time, we did have one elective course running that required attention. Based on the guidance from the central administration and our provinces' Chief Medical Officer (CMO) I was able to submit plans to return to class while the scope of the pandemic was still unfolding. On two occasions, within minutes of submitting my plan, guidelines were released by the CMO that made my contingencies obsolete. A third plan was approved and although the students and instructor were able to have one or two more sessions in person, the next round of announcements from the CMO explicitly ended all face-to-face interaction on campus until further notice. Fortunately, it was so late in the current term that students' experiences were not impacted in a major way, but it did increase my awareness of the issues that would now be presented to our returning technology education students.

The issue of returning students was twofold. Not only did we have our current cohort returning from their teaching internships to take their final two courses, but we also had our new cohort of students already accepted and ready to start their program. The acute issue was our returning students, as their first course (Computer Numerically Controlled design and fabrication) was due to start in a little over three weeks. Emergency meetings were coordinated with the instructor, instructional assistant, and the office of undergraduate studies and a plan to transition the Computer Aided Drafting (CAD) portion of the course to a remote model was proposed and the instructor agreed to shoulder the burden of the transition within the very short window of time that we had remaining. The bigger issue with this course was that we were still in a position of not being allowed any physical access to our facilities. Questions were raised as to whether the students actually needed to physically access our facilities in order to complete the course. I responded to these questions by indicating that if our students could not learn to use the CNC machinery that they would not be qualified to receive their course credit or their actual diploma. At this point another plan was proposed and adopted that would see the physical aspects of the course postponed until the very end of the term. The plan would call for one-on-one instruction for each student with the instructor and instructional assistant and fell within all the existing CMO and university guidelines. Being able to finally communicate this to the students relieved a lot of anxiety for them as they knew their graduation depended on receiving this course credit. After dealing with this acute issue, scheduling for the remainder of the program became the top priority.

As the university was still developing procedures for accessing on-campus facilities and time was not on our side for the new cohort's start, the decision was made to evaluate the typical program schedule in relation to which courses might be more conducive to remote instruction. We typically start the new cohort with a basic materials processing course and later in the term move to residential construction and systems. In addition to these two courses, students also

take communications technology and computer technology courses during their first term. In consultation with the instructors, the decision was made to move both the materials processing course and the residential construction course to the fall term. These courses would be replaced with general education courses and the communications and computer technology courses would be moved to a remote model. While these two courses were more conducive to the move to remote learning, there was still a major amount of preparation needed. Each instructor was tasked with developing kits that would be sent to students. These kits were composed of components, tools, and accessories that they would normally have onsite to work with. While the kits were not as complete as the resources available onsite, they were deemed to be sufficient to offer each course remotely in this emergency situation. Again, our instructors agreed to shoulder the burden of not only re-designing their courses for remote learning, but also resourcing their courses with very little lead time and within the context of the major supply issues created by the pandemic. While we were able to create equitable access to the technology we provided, there were still questions of equity with students' personal technology as we soon learned that there was a large spread in student technology. The courses that were moved to the fall had their own issues, which primarily revolved around onsite capacity in relation to physical distancing restrictions and instructor retention.

While we limped through the spring and summer semester there was time to plan for the fall. By now the university's framework for submitting and evaluating on-campus activity was mature enough to give some level of certainty for planning. At this point the physical distancing requirements became the biggest hurdle. The capacity of our facility was hampered by the six-foot physical distancing regulations and we were therefore put in a position that required us to re-think the cohort structure. In order to stay within the COVID-19 regulations and still offer the courses the cohort was split into two separate groups of 10. While this separation was fine in theory, in practice it presented other issues – mainly related to scheduling and instructor course load. First, splitting the cohort in half created two slots for each course where in the past the schedule was designed to work with general education courses throughout the spring and summer semester. Second, this move effectively maintained each individual student's class time, but doubled the course load for each instructor. This doubling of course load had contractual implications for our instructors as they are all employed through per-course contracts. Balancing between their collective agreements and maintaining their interest for teaching a double workload was the final piece of the puzzle that allowed us to offer the program during the pandemic.

Regardless of the issues faced, it was reassuring that all administrative levels of the university recognized the importance of maintaining practical and experiential programming that included our technology education diploma. Without the consultation and cooperation of faculty and university administration, instructors, instructional assistants, and our students our ability to maintain our programming would have been very questionable. Going through this experience in an administrative position has reinforced that positive outcomes are still truly possible in trying times.

A Teaching Narrative

From an instructional perspective, the transition from a face-to-face pedagogy to a remote offering within the domain of computer science and robotic systems created a lot of work

leading into the course. Re-designing for a technical remote offering required a revision of how to deliver a hands-on course through virtual interaction without modifying the content. The following courses were offered remotely over two consecutive semesters (Summer / Fall 2020):

> ***ED3752 - Teaching Communication and Computer Technology Systems II*** *- This course examines the application of various communication and computer technologies related to hardware, software, and the required infrastructure. Students will engage in activities that will provide insights into how current teaching and learning strategies can be blended with fundamental computing principles and processes within a framework of project and problem based learning. Topics include: computer architecture, block-based programming, text-based programming, software development, interfacing, and physical computing.*
>
> ***ED4752- Teaching Robotic Systems*** *This course is designed to provide students with an understanding of key concepts in robotic development and control applications. Students will complete practical activities that promote development of the skills necessary to deliver a comprehensive program in this area of study. Topics include: the study of electrical energy, analog and digital electronics; fabrication techniques; object oriented/event driven programming; and wireless robotic control over virtual network computing (VNC).*

An early challenge was a logistical one, combatting supply issues that arose during the beginning weeks of the COVID-19 shutdown and disruption. Accessing technical supplies that were not considered essential nearly left the course offerings without appropriate resources. Working with vendors to find the appropriate electrical components and accessories was difficult for two main reasons. First, finding a vendor to source 22 full kits for the course was problematic as supplies were low across Canada and the lead time for re-stocking was affected by the pandemic shutdown in many countries. The reality that many “in-stock” items were not physically onsite but actually with their suppliers who were often located overseas created longer lead times on receiving the items. The tight timetable to resource technical components became quite the learning curve for procuring electronic materials during a global pandemic. Second, the materials had to be received on-site at the university then sorted and redistributed to students. Thankfully, the course was supported by an instructional assistant who was able to coordinate the redistribution but the shipping of materials to students across the province and country meant more time.

Developing a functional, pragmatic course website that would effectively guide pre-service teachers through technical processes posed the second challenge. In preparation for the course offering, a web-based resource was developed to communicate every aspect of the technical content. The resource relied heavily on pre-posted examples and screencast videos. The development of such a media-rich resource took time leading up to the course which meant a greater demand on the instructor’s pre-course schedule as many program instructors work full time in K-12. Fortunately, the course website could be used in future offerings and will offer a resource for program graduates moving into technology education positions. The resource has already been useful for those pre-service teachers who taught similar topics during their internships during the Winter 2021 semester.

Supporting technical activity during a remote offering was the third, and perhaps the biggest challenge. Assisting pre-service teachers navigate the hands-on content through synchronous and asynchronous dialogue proved problematic at times. Instructors of technical courses often overlook the amount of time spent troubleshooting physical issues that can arise with hardware resources. The ability to see the problem in situ and work with circuits / code in a direct manner was not possible when working remotely. ED3752, for example, was an offering that, at one point, focused on the setup, installation, and use of a single board computer (Raspberry Pi). Coordinating the physical setup for 20 students, many of whom with no prior experience, became a mid-course hurdle. From students using different types of computers to those who had little understanding of general hardware (i.e. micro SD cards, card readers, computer ports), issues arose in bringing all students to the appropriate setup point for physical computing. Foreseeing this issue, tutorials were incorporated into the course website along with links to any necessary software (MAC and PC versions) and similar web-based resources (i.e. Python library documentation) that would be required throughout the offering. A similar challenge arose when students were required to connect their prototypes into the general-purpose input/output (GPIO) pins of the Raspberry Pi and ensure their Python code referenced the appropriate pins. Troubleshooting issues with a coded prototype became a challenge as students would often communicate the issue via asynchronous methods as it arose without including the code, a visual of the physical pinning, or even a detailed account of what actions were already taken to troubleshoot the issue.

Overall, students did develop a strong foundational knowledge within the technical areas of the course offerings despite many of the challenges. Final student evaluation within the course offerings were noted to align with an academic standard consistent with previous semesters. The reduction of some traditional support structures pushed many students to work through issues where classmates would often intervene too early. Peer support has always been an important structure within the technology education diploma program as an emphasis is placed on a constructivist epistemology. As courses transitioned to a new, virtual environment, pre-service teachers no longer had their peers beside them working on a similar task. It is also important to note that within the technology education diploma program, many of the pre-service teachers are not acquainted prior to their admission and completed several courses during the COVID-19 transition before being enrolled in a blended offering. The forced independence associated with remote learning became a push factor for the development of a stronger technical identity in technology education. Having to work through obstacles independently / remotely removed the tendency and temptation for students within a shared physical environment to call on their peers before working through the issue themselves.

Analysis and Discussion

Thomas' Analysis of David's (Administrative) Narrative

David's narrative described the challenges of shifting course offerings from traditional, face-to-face pedagogy to remote and blended models from an administrative perspective. While challenges were highlighted throughout the narrative, the importance of communication between institutional administration and program leadership was clearly identified in David's description. He mentions early experiences in relation to the institution's operational tempo and the fluidity of institutional direction. David described the difficulty with aligning plans with

ever-changing information. This administrative perspective paralleled Aagaard and Earnest (2021) assertions that highlighted the importance of clear lines of communication between administrative leadership to successfully navigate the impact of pandemic-related hurdles on educational offerings.

The suspension of all on-campus activity posed a significant hurdle to technical course offerings within the technology education diploma program. David described the challenges associated with balancing COVID-19 regulations and maintaining the integrity of course offerings while also working within tight deadlines. Aagaard and Earnest (2021) described these as the hard decisions associated with planning for select course outcomes to be met virtually and planning for practical outcomes to be accomplished in-person. David described adjusting through the early offerings during the pandemic which aligned with Butler's (2018) notion that the technology education program offerings were in survival mode when presented with such a significant disruption.

As course offerings during the first term were re-designed for remote delivery, David emphasized the importance of instructors. He noted their role in re-designing courses for remote delivery and developing kits of necessary components for student use. However, working within tight timelines and navigating institutional requisition procedures did create issues as materials either arrived just in time for immediate redistribution to students or after the offering start date. This closed any window needed to properly test the re-designed workflow, the compatibility of technological components, and ensure a smooth remote offering. Instructors did shoulder the burden and accepted the arrangement with full disclosure but the new arrangement added pressure to course logistics. While equitable access to course technological components was a priority, the reality of student geographical distribution meant a potential delay regarding the distribution and replacement of materials. Anecdotal evidence from instructors and instructional assistants noted the additional pressure associated with the re-design and the potential for coursework disruptions for students who require logistical aid.

David noted the complexity of coordinating in-person fabrication laboratory work while meeting COVID-19 regulations. Splitting the class to maintain social distancing had to occur and therefore increased the course workload for instructors which could have thrown a significant hurdle into the blended delivery of the program. David’s concerns regarding workloads demonstrated an administrative awareness that offerings during the pandemic have the potential to impact the demands placed on instructors. Day et al.'s (2021) work highlighted the potential for faculty inequities to emerge as institutional shifts towards remote offerings are forced upon faculty members.

Ultimately, David’s narrative described the challenge of administering a shift to remote and blended offerings while working within the boundaries and approval structure of the institution; adhering to COVID-19 regulations; ensuring pre-service teachers move forward in the program; and recruiting instructors willing to accept the demands of teaching during the pandemic. His perspective emphasized the continual tight windows and short deadlines to create the action plans for a shift towards course delivery during a global pandemic. David’s experiences are applicable beyond the context of this study and echo lessons learned at other

institutions that sought to adapt practical offerings at the onset of the March 2020 shutdown (Aagaard & Earnest, 2021).

David's Analysis of Thomas' (Teaching) Narrative

Throughout Thomas' narrative one theme remained constant -that of maintaining the integrity of his courses to support student learning and achievement. He maintained integrity in three ways. First, while he was faced with multiple challenges at the beginning of the transition, such as the almost complete collapse of normal supply chains for equipment and components, he demonstrated through his narrative that with persistence and tenacity the objective of putting physical resources in the hands of his students were met. Within the discipline of technology education, the manipulation and creation of artifacts is paramount and no transition to remote instruction would be sufficient without this element. These challenges echo Day et al's. (2021) report of similar obstacles for field-work related courses and should not be underestimated, as without appropriate materials and components Thomas' courses would not have met the criteria for credit.

Second, Thomas reported that developing and providing a supportive online presence was paramount in his successful transition. As Day et al. (2021) pointed out, not all faculty had the technical ability or experience to provide support for their students. From this perspective, our program was fortunate to employ Thomas. While not explicitly mentioned in his narrative, peer and student feedback would indicate that his level of technical expertise in the development and utilization of custom educational technology supports are very highly refined. Some research into the utilization of technological supports for educational endeavors illustrates that a teacher / instructor's level of comfort with the technology may influence their pedagogical practice and in turn may affect student engagement and achievement (Lee et al., 2017; Rakes et al., 2006). In this case the students and program in general benefited from Thomas' command of not only the content-based technology related to the course objectives, but the educational technology needed to move to a pedagogically sound remote iteration of his courses. While this might be the overall feeling reported in Thomas' narrative, there is anecdotal evidence from students that they felt overwhelmed, lost, and isolated at times regardless of the supports provided. These reports provide another avenue to research the impact of such transitions to better understand the nuanced supports that could be provided in the future to ease student stress and discomfort without lessening the rigor of the course objectives. Regardless, Thomas appears to have effectively side-stepped one of the major hurdles identified in the nascent literature on this phenomena (Aagaard & Earnest, 2021; Day et al., 2021).

Third, regardless of the technology or supports in place, no course, whether face-to-face or remote, can be successful without a solid pedagogical approach. Throughout Thomas' narrative there is evidence of the importance he placed on a constructivist pedagogical approach. He mentioned several times the importance of peer-interaction within technology education and how this was a challenge in a remote learning environment. The loss of community and social presence has been reported by Day et al. (2021) and was echoed by Thomas' account. What was interesting are Thomas' thoughts on the benefits of losing such a close-knit social connection as he reported that the lack of this physical network forced students to troubleshoot technical issues by themselves and with the help of Thomas rather than just

allowing a peer to fix something for them. The idea of intentionally limiting the peer interactions at certain points of technical learning to promote the emergence of self-confidence and individual skill development is something that should be revisited when face-to-face instruction resumes after the pandemic. While the idea of producing self-confident learners and future teachers that are able to problem solve effectively within the technological sphere is a main goal of the program, if our students have not experienced design or problem-based learning environments in their past education, this type of transition can be difficult and jarring. Compounded by the situation created by COVID-19 of stripping all of our normal scaffolds, it is now important to empirically investigate how the students experienced the limiting of peer interactions to better design a balanced pedagogical approach in light of this new knowledge.

One final theme that became apparent while analyzing Thomas' account was the amount of dedication displayed by contractual instructors in our program. While I did allude to this in my own administrative narrative, Thomas' narrative plainly puts into perspective that without the willingness of faculty and staff that might be in a more precarious employment category to step-up and do what needed to be done, many courses and programs would not have survived the remote transition. Hopefully university administrations will recognize these contributions in a meaningful way in the future.

To summarize, there were both challenges and benefits to the sudden and unprecedented shift to remote and online learning caused by the COVID-19 pandemic. Challenges included maintaining equitable access to physical materials and technologies for all students, scheduling issues related to changing pandemic rules and regulations, and a loss of social presence with students. Benefits included more student autonomy, less dependence on group work for technical skill development, and the development of alternative delivery models for pre-service technology education that could be used to expand program offerings to non-traditional students.

Conclusion

The COVID-19 pandemic is far from over and the lessons learned from the first year of dealing with the implications are currently being adapted for the next cohort of our technology education pre-service diploma program. While the findings are contextual, this type of study is commensurable with the understanding and knowledge that is becoming apparent in every institution and to everyone with a stake in post-secondary education. There remain aspects that hold potential value across jurisdictional boundaries and add value to the emergent literature on experiences in education during the early pandemic. The analysis of the data and ensuing discussion highlighted the importance of maintaining the tangible hands-on, minds-on activities that are core to technology education and other disciplines. Moving forward, student perceptions and realities of their experiences should be an avenue for research to gain a deeper understanding of the phenomena and should help with balancing the next iterations of program delivery. It was also worthy to note the unheard-of flexibility of typically inflexible university policies and practices that transpired over the last year as everyone from the president to the janitorial staff shifted gears swiftly to maintain programming for all of our students. In the end, the pandemic may be seen as one giant case study that disproves the idea that post-secondary institutions are rigid, and the path may be open to try new pedagogical approaches in the future based on the experiences of teaching through the turmoil.

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Dual Delivery Design Studios: Exploring Design Learning for Hybrid Cohorts

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Abstract

In the wake of 2020's move to remote learning and teaching, institutions of higher education began experimenting with approaches that combine face-to-face and online learning. This article reviews one learning and teaching group's development of guidance for "dual delivery" and reports on focus group conversations with staff coordinating dual delivery design studios. It highlights key considerations identified by the group—learner equity and access, cohort building, and staff and student perceptions—and reports on efforts to address these through the design and coordination of studio subjects. This marks the first known study exploring hybrid/dual delivery in the design studio context. Findings suggest that treating the hybrid split-cohort mode of 2021 as an amalgamation of online and blended learning approaches is to ignore its unique learning design challenges, and to underestimate the implications of dual delivery for studio teaching. In addition to specific strategies for the design of studio learning activities, teachers' "on-the-ground" reflections offer additional insights for studio coordination—on distributed, place-based learning; on peer-to-peer interaction around student work; and on approaching learning design on the premise of "contingency". The article encourages testing of new pedagogic forms that can combine learning modes across space, and engagement with activities over time, in support of rich design learning for emerging hybrid cohorts.

Keywords

design studio pedagogy, hybrid learning, dual delivery, cohort building, learner equity

Introduction

In the wake of 2020's move to remote learning and teaching, institutions of higher education around the world began experimenting with "hybrid" approaches that combine face-to-face and online learning (Laker, 2021). While this may have initially been approached as a temporary measure to accommodate varying student interest/ability to return to campus, such "dual delivery" models will nevertheless influence educational futures through shifts in practices and values. When a single subject combines two or more learning modes for groups of enrolled students (e.g. fully online and "blended" learning) multiple teaching challenges arise, not least those of providing equitable learning and community-building opportunities. Overlaid with the

trials of distributed design studios, we find ourselves in a moment of pedagogical experimentation, confronting long-held teaching traditions.

In the first part of this article, we outline one learning and teaching group's development of teacher-facing guidance in anticipation of the challenges noted above, including unpacking the "dual delivery" model. The presented literature and conceptual frameworks underpinning this approach illuminate concerns beyond those of fully blended or fully online subjects. In the second part of the article, we report on a series of focus group conversations with design studio coordinators teaching in dual delivery mode. Participants reported "on-the-ground" experiences to augment the guidance delivered and test its application. Additional considerations regarding student engagement, access to physical sites and peer-to-peer interaction across learning modes emerged for design teachers under these circumstances. These challenges were not addressed as temporary measures on the road back to pre-pandemic teaching. Rather, they presented opportunities for more considered, and considerate, approaches to student-centred design education. In addition to specific strategies for the design of studio learning activities, their reflections offer insight for studio coordination—on distributed, place-based learning; on peer-to-peer interaction around design artefacts; and towards a pedagogy that embraces "contingency".

Context

The Built Environments Learning and Teaching (BEL+T) group, within the Faculty of Architecture, Building and Planning (ABP) at The University of Melbourne, is an academic group focussed on the sustained improvement of education for built environment disciplines. Established in mid-2018, the group applies creative problem-solving and design-led approaches, evidence-based research methodologies and project-focused consultancy to improve teaching quality and student engagement. BEL+T draws from its members' diverse skillsets as designers and researchers to engage with the Faculty as the location, inspiration and beneficiary of focussed built environments learning and teaching research.

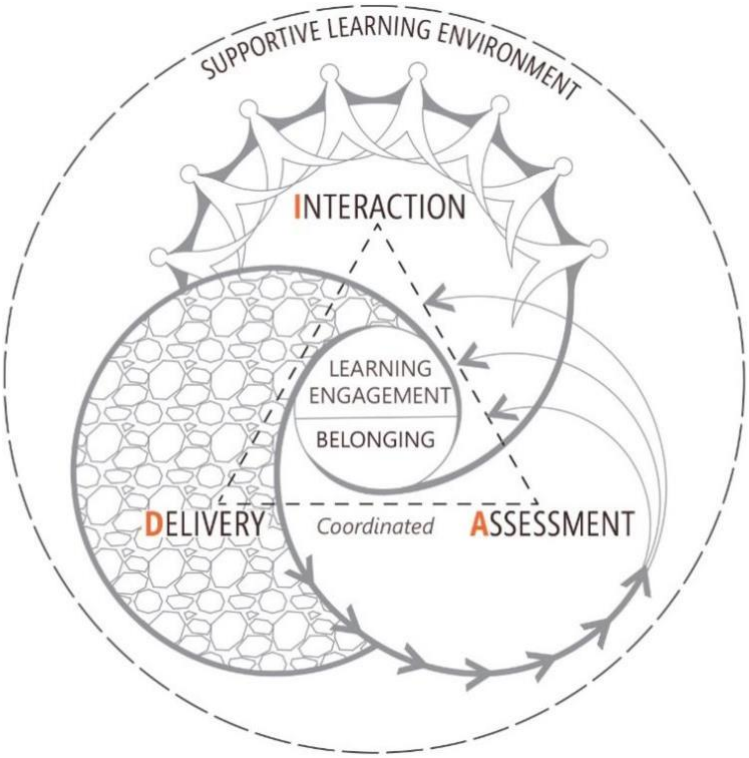

Figure 1. BEL+T's DIAgram v2.0

Throughout 2020, BEL+T's challenges included identifying ways to understand, communicate and support new needs and practices emerging from the shift to online education. The BEL+T website became a key space for sharing resources and emerging approaches, including "Guidance for Teaching Online" pages organised around BEL+T's DIA framework (see Figure 1, available at https://melbourne.figshare.com/articles/figure/BEL_T_DIAgram_v2_0/14398637?file=27629193).

For the purposes of this paper, it is helpful to briefly note the constituent elements of the relational DIA framework and its DIAgram, developed as a "learning design system" (Dalziel, 2008, p. 376) and drawing on Oliver's tripartite model for online learning design (Oliver, 1999; Oliver, 2001). Further detail of its development, testing and delivery in response to pedagogical, technical and cultural challenges of the shift to online teaching is described elsewhere (Tregloan & Thompson, 2021). The DIA centres on two paired student-focussed pedagogical aims: *learning engagement* and a sense of *belonging*. These provide focus for three of teaching's primary tasks: *Delivery* of subject content; supporting *Interaction* between students and their peers and staff; and effective *Assessment* for learning. These are presented as interrelated, and as activities needing effective *Coordination*. The significance of *Coordination* for online learning activities is also published elsewhere (Soccio et al., 2020), as is the importance of a *supportive learning environment* as an encompassing field (Thompson & Song, in press).

The DIA was applied to review over 300 ABP Faculty subject Learning Management System (LMS) sites in 2020, highlighting key pedagogical and technical challenges of the move online

and informing ongoing iterations of the approach and development of resources and tailored support. The particular qualities of design studio pedagogy were central considerations and brought specific inflections to the elements of the DIA, as explored more fully below. For most of ABP's undergraduate and postgraduate programs, design studios reside at the centre of curricula and student experience. In a given semester, the Faculty offers a host of design studios, including in Architecture, Landscape Architecture and Urban Design.

Following the tumult of 2020, continued border closures facing international and some domestic students delivered a new teaching challenge for 2021. The University of Melbourne elected to enrol students who could (and would) return to campus alongside those remaining in online learning mode, designating this "dual delivery" (see Figure 2). Forty-six subjects in the Faculty, representing 33% of the semester subject offering (60% of student subject places), were identified as dual delivery. Of these, over 50% were studio subjects.

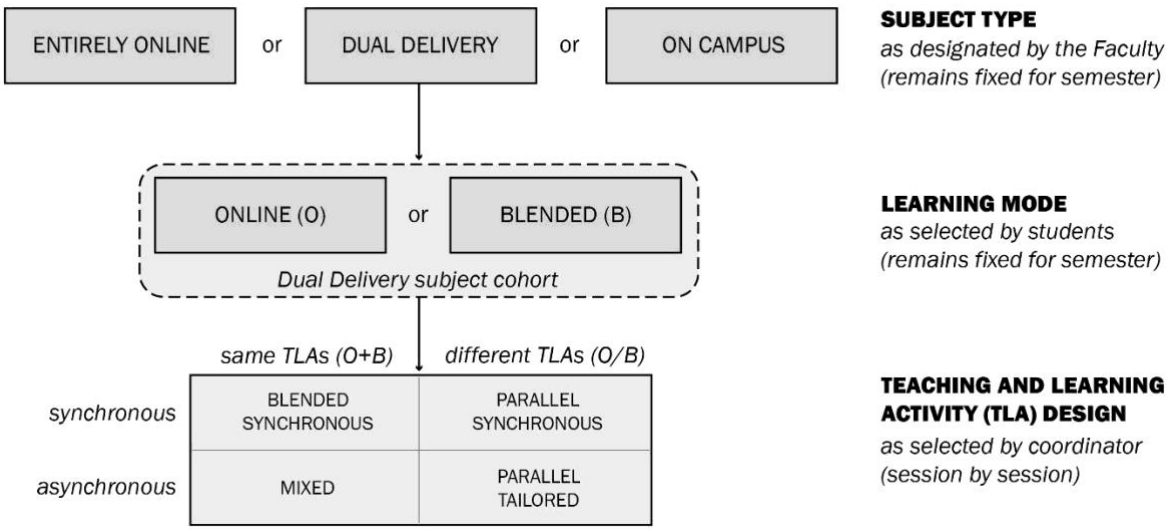

Figure 2. Subject types; Dual delivery learning modes; TLA design options

Seeking to anticipate major challenges and concerns of this new approach, the Guidance for Dual Delivery developed by BEL+T drew on lessons of 2020 and review of student feedback from that year, structured around the elements of the DIA framework (BEL+T Group, 2021). The next section provides an overview of its development.

Development of a Dual Delivery Guide

A review of scholarship relating to dual delivery, including its constituent and tangential concepts, formed the background to the resource's development. While the lack of consistent definitions and an overlap of related approaches introduced some complexity, existing education models designed for spatially distributed student cohorts offered useful perspectives. Models foregrounding student choice included the work of Beatty (2019), whose Hybrid-Flexible (HyFlex) model centres on "class sessions that allow students to choose (on a daily or weekly basis) whether to attend classes face-to-face or online, synchronously or

asynchronously" (p. 13). This approach responds to broader calls for more flexible learning models:

> *"As a result of…changes in attendance patterns and enrolment modes, universities need to find new ways to engage students in learning activities that can be effectively undertaken irrespective of their geographic location" (Bower* et al*., 2013, p. 92).*

The authors cited above also note concerns that "remote students may not be receiving an equivalent education to their on-campus counterparts" (ibid., p. 93), foreshadowing a key concern of 2021 as highlighted below. Unsurprisingly, interest in models like HyFlex surged during 2020, as institutions looked for ways to transition "back to campus". Regehr and McCahan (2020) were amongst the first to suggest how universities might operate post-COVID. They stress, as part of their proposed "Planning for Recovery and Adaptation" phase, that subjects should be offered as a:

> *"…flexible learning opportunity [that] affords an in-person experience for students who would like to engage on-campus, but also addresses the needs of students who may need to learn from home during part or all of the term." (p. 118).*

The earliest identified study to refer specifically to the term "dual delivery" compares the academic performance of on-campus and online students enrolled in the same engineering course (Enriquez, 2010). In this case, synchronous content was simultaneously delivered to on-campus students via a computer projector, and to online students via a video-conferencing software and virtual classroom. Enriquez's study is an early example of the model often called "blended synchronous learning" or BSL (see Bower et al., 2014). In general, this involves students online and on campus engaging in the same learning activities, at the same time, in a "shared" space. Elsewhere, this model is referred to as "hybrid-concurrent" (Monash, 2021), "multi-access learning environments" (Irvine, 2009) or "simultaneous instruction" (White *et al.*, 2010). It requires teaching spaces fitted with enabling technology (e.g., multiple cameras and microphones) to allow students across both learning modes to engage synchronously with the same content and activities, as well as with one another across the digital divide.

The dual delivery model adopted by The University of Melbourne called for students to nominate a preference for online or blended learning modes for each subject at semester enrolment, with subject type allocation (see Figure 2) considering student preferences. Once each student's learning mode for a given subject was confirmed, the subject type and learning mode allocation were fixed for the semester, although activities within the subject's design could vary significantly as outlined below. University guidance required that teaching and learning activities (TLAs) be designed such that all students were equally able to attain the subject's intended learning outcomes (ILOs). Aiming to support equity across the whole cohort, it was also specified that all lectures would be delivered online for all students, and that all summative assessments be undertaken online. Within this framework, BEL+T identified four TLA design types that considered activity timing and engagement by learning mode (Table 1).

Table 1. Matrix of four TLA design types

	Same TLAs (Online and Blended Modes)	**Different TLAs (Online vs Blended Modes)**
Synchronous	*Blended synchronous:* students online and on campus engage in the same learning activities, at the same time, in the same space. This approach requires teaching spaces with technology that allows students of both learning modes to engage with the same content and with one another.	*Parallel synchronous:* students online and on campus engage in different (but equivalent) learning activities at the same time.
Asynchronous	*Mixed:* students online and on campus engage in the same learning activities outside of timetabled sessions.	*Parallel tailored:* online students and those on campus engage in different (but equivalent) learning activities at a range of times (some the same, some different).

The BEL+T Guidance for Dual Delivery anticipated key concerns through the lens of the DIA framework outlined above. Following the University's guidance, it was suggested that the *Delivery* of information and learning "objects" should be asynchronous, making use of subject LMS sites as shared online spaces equally available to all. Suggestions relating to virtual site visits drew on techniques developed to offer site "experiences" to students learning remotely during 2020's lockdowns. Approaches to *Assessment* similarly focussed on ensuring parity of access, and highlighted the significance of both the quality and the quantity of feedback for learning. In such a complex model, the importance of effective planning and *Coordination* was also crucially important, including clear communication. BEL+T members, noting the tendency to use "on-campus" as a synonym for "blended", or "cohort" for "learning mode", developed a glossary to offer some consistency and avoid confusion.

While the provision of information and support for planned activities called for clarity, the DIA elements related to interpersonal relationships demanded more nuanced consideration. These are, of course, particularly significant to studio learning as understood through a "communities of practice" model (Williams, 2017). Differing learning modes imply different modes for *Interaction* between those students and teaching staff, and support for student-to-student interaction across modes and timing introduces further complexity (see Table 1). The central concerns of the DIA framework illustrated in the DIAgram (Figure 1) questioned what effective *learning engagement* would entail for students in either mode, while fostering a sense of *belonging* across modes raised perhaps the greatest challenge. Supporting all students to enjoy similar opportunities to connect with peers and wider academic/professional communities suggested more direct involvement by teaching staff. Particularly in stressful times, a *supportive learning environment* asked staff to balance intended learning challenges with suitable support, and to recognise emerging differentials across mode and individual circumstances.

In parallel to review of scholarship and institutional advice, student perspectives informed the guidance produced. Review of 2020 surveys and teaching award nominations were sorted and analysed from both on-campus and online experiences through the lens of the dual delivery model, identifying key themes to student values and concerns. This allowed a shift towards the specific disciplinary concerns of built environments and design education, and student perspectives that could inform dual delivery approaches. Key considerations were identified in relation to equity, belonging and communication (see Table 2), as further detailed below.

Table 2. BEL+T's Key Considerations for Dual Delivery

Learner Equity and Access:

- providing all students with equivalent opportunities and support to achieve a subject's intended learning outcomes;
- allowing for differences in learning modes, and the opportunities or challenges (e.g. digital access) they present, when preparing and reviewing student activities

Cohort Building:

- offering informal and formal activities for all students to develop a sense of belonging and to identify as a collective learning community;
- considering how students in each learning mode can contribute and participate most effectively to the activities of the whole cohort (avoiding either group becoming an "audience").

Staff and Student Perceptions:

- transparently communicating dual delivery subject design and the role of learning activities for students in each learning mode;
- using consistent language (a glossary was provided) to help students who may be enrolled in a number of learning modes across subjects.

These key considerations framed much of the studio teaching focus group discussions at the core of this study, as outlined next.

Design Studio Coordination: Framing of Focus Groups

The BEL+T Guidance for Dual Delivery was made available to staff online and through LMS site consultations prior to the first semester of the model's existence. Midway through semester, dual delivery studio coordinators were invited to a series of facilitated conversations. This activity was covered by Human Research Ethics Committee approval. These discussions explored whether BEL+T's identified key considerations (see Table 2) were influencing particular pedagogical demands of design studios. Discussions via Zoom were recorded and transcribed verbatim before independent review by four members of BEL+T to identify themes, subsequently confirmed by consensus.

Invited participants were selected to represent a cross-section of dual delivery design studios across both undergraduate and postgraduate levels, plus a discipline mix including Architecture,

Landscape Architecture, Graphic and Performance Design. Studio subjects led by participants ranged in size from 17 to over 200 students, bringing an array of scale-related coordination challenges, as well as differing levels of student contact. For subjects with smaller enrolments, a coordinator typically led a studio group in either blended or online mode. Coordinators of subjects with larger enrolments, in contrast, managed a team of tutors (mainly sessional staff working in local practices) with limited participation themselves in direct studio teaching. Typically, studio subjects in the Faculty include 16 students with one or two tutors. Large studio subject enrollments are divided into studio sections of similar scale. Studio timetabling is typically distributed throughout the week allowing for individual student study plans and flexible use of learning spaces.

While focus group participants had extensive experience of on-campus studio teaching, like most teachers, their pre-2020 experience of online teaching or related scholarship was limited. Case studies of virtual and/or blended design studios have suggested the potential for promoting learner flexibility (Bender & Vredevoogd, 2006; Fleischmann, 2018); "networked" collaboration and connectivity (Ioannou, 2018); community engagement (*ibid.)* and fruitful cross-cultural exchange (Hou & Kang, 2006). Other scholars have posited that these affordances align with emerging skills and expectations of professional design practice (Pektaş, 2015), and also that potentially "flat hierarchies" of virtual learning environments (Schnabel & Ham, 2012) might challenge problematic power dynamics of conventional studio pedagogy (see Dutton, 1989). Nevertheless, leading up to 2020, scepticism that design subjects—namely their dialogical practices and studio critique events—could be delivered fully online remained widespread amongst the academic community (Fleischmann, 2019, p. 12).

From this position of general scepticism, the 2020 shift to "emergency remote education" (Green *et al.*, 2020), prompted a wide range of emotional responses (Brown, 2020). Students expressed appreciation of the increased flexibility and autonomy, while lamenting the loss of unmediated social encounters and access to specialist tools and resources (Marshalsey & Sclater, 2020). It became clear that:

> *"Moving assessment and engagement to online formats has consequences for practice-based art and design courses: distributed learning changes how we teach and learn" (ibid., p. 826).*

Beyond 2020's shift to online studio teaching, treating the hybrid split-cohort mode of 2021 as an amalgamation of online and blended learning approaches is to ignore its unique learning design challenges, and to underestimate the implications of dual delivery for studio teaching. While we have reported on related scholarship above, to our knowledge, the specifics of this challenge have not been studied or previously published. Nonetheless, institutions are seeking ways to teach both online and blended or on-campus student cohorts jointly and effectively. The focus group discussions exploring implications of dual delivery for design studio coordination offer further lessons across the identified themes reported below.

Focus Group Outcomes

Testing Dual Delivery Guidance Against Studio Coordinator Experience

Learner Equity and Access

The key considerations around learner equity and access (Table 2) centered on TLA design to devise "equivalent" opportunities for all students to achieve subject ILOs. Generally, participants described their approach towards student equity as: a) asynchronous *delivery* of a shared set of resources and *assessment* information through the LMS, with optional online synchronous Q&A sessions; and b) offering opportunities for large-scale asynchronous "mixed" events supporting *interaction*, while identifying studio sections for either online or blended modes, with an accompanying suite of virtual platforms. As one coordinator of a large subject described:

> *"On our [LMS] site, we've got what we're calling the studio [section] portals, and within each portal they have a Zoom link, a OneDrive link, an at.studio link and a Miro link. We consciously set that up exactly the same, regardless of the teaching modality."*

Some participants noted differences of engagement on virtual platforms by learning mode, however. One observed that the students participating in online mode used the cohort-wide whiteboard platform more consistently, whereas another described a lack of engagement amongst online-only students. This engagement differential is significant for learner equity in professional training, such as architectural education, in which personal and emotional investment has substantial overlap with an individual's learning (Shulman, 2005). At the same time, individual student differences are regularly navigated by design teachers. Indeed, scholarship notes how the nature of the design process itself suggests each student will take their own path to achieve subject ILOs. As Boling *et al.* (2020) contend:

> *"Students can legitimately, not erroneously, differ in the clusters of activities they use to approach and complete their designs" (p. 1875).*

The (significant) challenge for design teachers in this regard is to offer equitable support opportunities across modes that can be tailored for individual student needs.

Cohort Building

BEL+T's dual delivery guidance identified subject-wide cohort building as another key consideration (see Table 2). This was primarily concerned with the potential isolation or exclusion of online-only learners. Across disciplines, *belonging* to a learning community is critical to academic success, wellbeing and retention (Araújo *et al.,* 2014). In studio education contexts belonging has been identified as a key element of occupational identity development, with individuals situating themselves and forming "identity horizons" in relation to their peers (Thompson, 2019, pp. 74-77). Likewise, design students value peer relationships for supporting their progress and persistence (Smith, 2015, p. 86), with collaborative design projects having been shown to contribute to wellbeing and personal growth (Thompson, 2016). Questions have been raised, however, regarding how such benefits translate to online learning environments: "How does a class form *collegial bonds of interaction* that may naturally and easily develop in a regular semester studio class?" (Gajendar, 2017, emphasis in original).

Participants described ways they designed assessment-related activities to promote belonging:

> *"Students had to produce a small design piece and put it up onto the discussion board and then give feedback on other students' work … in class time but also through the week ... So that was a really nice activity getting students to bond, talk to each other, find out who each other is …"*

As in this account, such bonding was most likely to occur within a single studio section—and therefore often within a single learning mode. As teachers ostensibly entered 2021 experienced in implementing cohort-building strategies for fully on-campus and fully-online semesters, participants noted that fostering a sense of community *within* a studio section of roughly 16 students was not particularly challenging. One even expressed concern that each section might be *too* tight a community.

Facilitating *interaction* across an entire subject cohort was described as much more challenging, however. Approaches differed based on enrollment sizes of subjects. The timetabling of larger subjects meant that subject-wide cohort-building activities would likely need to be asynchronous. Participants noted that cohort-wide *delivery* of content, including guest lectures, provided a shared experience, and online platforms were also designed to allow student interaction across sections/modes:

> *"Regardless if the studio is conducted, let's say, face-to-face or online, every student needs to have their work online in the Miro board so that every student has access to every section's work and they can, in a way, feel more connected to the field."*

For subjects with smaller enrolments, participants described attempts to employ BSL. One subject with two studio sections, one in each mode, arranged the timetabling such that the two sections overlapped. This was one of the few attempts described to support cohort-wide synchronous interaction.

The most deliberately "engineered" example of subject-wide cohort building reported was the coordination of a collaborative design project for one of the larger subjects in the study. Students were asked to develop personas to serve as each other's clients, with a restriction that no student could pair with another student from their own studio section. This prompted asynchronous communication between students across the cohort:

> *"So we would have students outside the studio [section] acting as imaginary residents on an architectural project ... So that's the moment we really invited communication between students, and it is about developing a studio culture, critical thinking, where students interact with each other's projects and give each other suggestions, how to improve their work."*

However, as this pairing process was conducted through anonymous questionnaires, designers and "clients" may or may not cross learning modes.

Staff and Student Perceptions

The third key consideration reflected particular challenges of subject *coordination* around consistent and clear communication (see Table 2). This emerged from a prior study by BEL+T that examined *coordination* in relation to student perception of good teaching in the ABP Faculty, resulting in five characteristics of well-coordinated subjects: structured, cohesive, consistent, organised and clear (Soccio et al., 2020). So while this challenge is not unique to the dual delivery mode, the co-presence of two learning modes offers a new twist. Prior strategies for managing communication across studio sections—such as using clear and consistent language for assessment-related content—could be translated to dual delivery. Participants described "dropping into" studio sections across learning modes to "check-in" and offer a single, cohort-wide point of contact. Likewise, gauging student engagement on virtual platforms allowed coordinators to identify potential discrepancies in tutor messaging, as described by one participant of a large studio:

> *"In the first week, we noticed that the face-to-face students were not making the use of Miro board that was expected. But it's actually a requirement by the studio in the course outline. We raised this with the tutors and sent weekly reminders of what they need to be looking into…or keeping an eye on, deliverables that are expected that week, specific criteria…"*

LMS sites became the place where educators demonstrated to students transparent and consistent communication, as described by one participant:

> *"We…have a weekly announcement sent out at the end of the week: 'This is what we covered, this is what to do for next week.' And we make a fun little video. So it kind of brings together everyone, hopefully, to this one space."*

For the exercise in which students paired across studio sections as designers and "clients", the coordinator shared with fellow focus group participants a set of diagrams illustrating the various scales of interaction facilitated through the approach: within studio sections, between studio sections and across the entire cohort. These diagrams were presented to students early in semester to provide clarity and visual language for the learning collaborations they would experience.

Three Revelations that Emerged through Transcript Analysis

Spatial/place-based Remote Learning

Dual delivery highlights the design and adaptation of assessment tasks in response to the learning contexts of spatially distributed students. This challenge emerged most clearly in place-based learning activities, the one clear example that resulted in a "parallel tailored" approach to TLAs amongst study participants. Focus groups reflected on how the move to entirely remote learning in 2020, together with local lockdown restrictions, prompted the development of virtual tours as visits to (typically local) sites. This marked a significant challenge for built environment disciplines, whose design studios typically respond to real spaces, growing foundational skills in the analysis of site features to inform responsive design proposals. Furthermore, site analysis is often conducted in groups, aimed "to help students deal collectively with large amounts of information in a short period of time" (Greenop, 2021).

For one coordinator of a smaller studio subject, site visits in the dual delivery context became an opportunity for student *interaction* across learning modes, despite geographic dislocation. Students who could visit project sites in Melbourne were encouraged to act as "surrogates", obtaining spatial information and data for those who could not. They took their peers on site visits via video-messaging apps on their phones, allowing the geographically remote student to participate synchronously. While this required navigation of time-zone differences, support for cohort-wide connection was noteworthy, and offered one of the few examples of BSL (without tutors present).

Several participants suggested *delivery* of digital site data addressed equity across learning modes, regardless of whether a student accessed the physical site in Melbourne. For one participating coordinator of a subject with roughly 50 students, concerns for site access prompted development of a parallel tailored approach. The redesigned *assessment* task required students who could not access the target site to conduct a precedent study on a site accessible to them of the same building type. Each student's research—of a precedent in another cultural and geographic location or of the studio's target site—contributed to the studio's shared knowledge base. In "redistributing intelligence" (Pektaş, 2015), the importance of student site access was mediated.

Notably, concerns surrounding site access exposed disconnects between individual students' chosen learning modes and their location. A significant number of students selecting online learning were evidently located within the metropolitan area of Melbourne and could therefore ostensibly access local sites. This reflects Fleischmann's (2018) survey of design students at an Australian university, in which 3 of the 40 respondents (7.5%) claimed to prefer an entirely online mode of learning when offered a choice between that and fully face-to-face and/or blended.

While the final outcomes of dual delivery studios are not available at the time of writing, one participant noted: "We've actually had some really surprising and beautiful results from students working in isolation". Certainly, the design work produced by students learning online in 2020 was of high quality. The Faculty's end-of-semester exhibitions were also relocated to an online portal in that year and showcased a growing engagement with platforms for personal design explorations, as well as creative collaborations over distance.

Peer-to-peer interaction around design artefacts

While the prototypical image of design studio remains a learning environment with permanent desks and the accumulated flotsam of student work, studios in many contemporary institutions operate as "hot-desking" environments in which students occupy a space for their timetabled session only. In our Faculty, studio sessions are distributed throughout the week to accommodate large cohorts of students. Thus, concerns regarding how, and how often, students might encounter and engage with each other's design process and artefacts existed before the 2020 move online.

As above, focus group participants noted that online whiteboard platforms, such as Miro, offered a lasting repository for student work, or "unlimited exposure to peer progress" (see Güler, 2015):

> *"Our timetable is broken down ... so it's very hard for [students] to go from one room to the other to see work of their peers. [But within the virtual environment] they have all these platforms by which they can connect and all the tools that we have in place."*

Such platforms facilitate both synchronous and asynchronous *learning engagement* whilst making the design process (and learning process) visible in ways rarely achieved in traditional studio environments (Jones, 2020, p. 45). This has also assisted *assessment*, offering a record of peer-to-peer and tutor feedback, as well as the ability to present, review, grade and moderate remotely. Fotaris *et al*. (2015) note the importance of shared platforms in virtual design studios for "providing students with both creative stimuli in the form of the work of their peers and with peer-review comments." The authors emphasise that, "studying the work of others can serve as an inspiration and therefore lead to approaching the design problem from different angles." Furthermore, Jones (2020) notes that the concept of "social comparison […] can be most easily applied by making student work visible to peers, just as would happen in a traditional studio" (p. 33). In other words, students who are geographically distributed can position their projects within a collective body of work. Other scholars have noted that cloud-based collaboration tools can help students develop skills for professional practice, providing "a setting for a rehearsal of future workplaces and [helping] prepare students for a global, networked, and competitive professional design practice" (Pektaş, 2015, p. 262).

For dual delivery, when it comes to facilitating *interaction* across learning modes, virtual whiteboard platforms have a particular advantage over simple LMS sites or social media platforms (like Facebook, as discussed by Schnabel & Ham, 2012). As Jones (2020) argues,

> *"The potential difficulties in online discussion can also be an advantage in design – we engage in dialogue about design and around objects of design. Using artefacts to negotiate conversation works well at a distance (p. 14)."*

Beyond its benefits for assessment, skill development and engagement, participants also noted the cohort-building advantages of virtual whiteboard platforms:

> *"I think that some of the stuff that we learned with the online modality [in 2020] actually makes this idea of a singular and total cohort much easier to communicate. … [On online whiteboards] the work stays up for the whole week and the students can look at one another's work, and they really are doing that. … So I get the feeling that students do feel like they belong to that larger entity."*

The ability for students to interact with one another through their work—the dyadic relationship between "doing" and "belonging"—is a key dimension of the "occupational engagement" that professional design education aims to cultivate (Thompson, 2019). This is marked by,

> *"…the sense of togetherness that one acquires through studio socialization via shared design activities (including but extending beyond collaborative design projects and group critiques), shared points of cultural reference, shared interests, and shared project or course objectives." (ibid., p. 76).*

Learning Design for Contingency

Given the initial shock that came with moving design studios online in March 2020, the calm of subject coordinators by early 2021 was noteworthy. The pandemic exposed the fragility of many traditional approaches to subject design, especially for design studios that were dependent on physical modelling, campus-based technology and site-specific experiences or documentation. There was a sense of command born of hard-won experience within an inherently unpredictable context. As one participant put it,

> *"The big change was in the previous semester, I feel, and what we are experiencing now is just, sort of another version of that big change."*

As designers themselves, they approached the challenge with creativity and interest. They described their approach to learning design as flexible and incorporating notions of contingency in the framing of learning activities and assessment:

> *"If, for instance, there was another lockdown, we wouldn't have to change anything at a structural level. The teaching modality would just shift for those face-to-face studios, but structurally, there would be no need to change anything."*

This approach follows the University's own guidance for dual delivery, that online learning and teaching modes function as the "default" position in terms of TLA design. Still, one participant voiced that this sense of uncertainty had its challenges, perhaps alluding to the psychological impact on teachers:

> *"I suppose the not-knowing is just something that sticks in my mind. And there's different schools of thought. … I know that within our department there's this idea that, 'Okay, [dual delivery] is just a temporary situation, we'll be going back to class online.' And I think, 'That's not the way things feel!' … It'd be nice to know where we're going — not that I know we can know."*

This notion of contingent teaching, differing from existing concepts of "flexible learning" (Tucker & Morris, 2011) or "adaptive learning" (Fournier-Viger *et al.*, 2010), can be understood as an extension from previous scholarship on the notion of uncertainty as an inherent feature of teaching (Helsing, 2007) and as an aim of education to promote student autonomy and resilience (Joosten, 2013).

In practice, participants approached dual delivery by weighing options for TLA design against the key considerations; they suggested equity was their primary concern, with an eye towards cohort building and maintaining consistent and clear communication. In theory, this granted a reflexive approach such that, if circumstances or input from students and tutors were to change, coordinators understood how modifications to TLAs would impact each learning mode.

Conclusion

While the 2020 move online delivered a shock to the system and a scramble for response, insofar as 2021 is "the year of hybridization" (Laker, 2021), it has opened a more nuanced set of challenges. Institutional efforts to engage with people located both proximate and distant is

giving birth to new activities and cultures, as well as new approaches to support them. The approach explored in this paper, which combines online and blended learning modes within a single subject cohort, is an early example of dual delivery being applied to the design studio context. While "the use of new participatory tools allows for many-to-many interaction, which corresponds better to the new modes of design practice" (Pektaş, 2015, p. 258), it also brings challenges to pedagogies that value physical engagement with site and artefact, and interpersonal exchanges that support dialogic learning.

This article shares guidance developed for dual delivery by BEL+T, a learning and teaching group in a comprehensive Australian university, distinguishing approaches recommended for the delivery of learning resources or support of assessment and feedback from tactics for effective learning interactions and fostering a sense of belonging. The article also highlights key considerations identified by the group—learner equity and access, cohort building and staff and student perceptions—then reports on efforts by studio coordinators to address these through the design and coordination of their studio subjects. It identifies emergent ideas and practices from this early experiment with dual delivery in design studio education, including those that address: spatial/place-based remote learning; peer-to-peer interaction around design artefacts; and learning design for contingency.

The article outlines further development opportunities as the experiment progresses—ways to build bravely on these emerging lessons by exploring a wider variety of teaching and learning activity types, while remembering the importance of key considerations. It encourages testing of new pedagogic forms that can combine learning modes across space, and engagement with activities over time, in support of rich design learning for emerging hybrid cohorts.

Privacy and Confidentiality Statement

Full permission and authorisation to use private data has been arranged.

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Teaching Design Thinking in a research-intensive university at a time of rapid change

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Abstract
In this paper we present a snapshot of the theories, intentions, practices and outcomes produced by a teaching and learning collaboration. This is located geographically and culturally at the University of Warwick, and temporally across the period 2020-2021 marked by the global pandemic. The case study illustrates how a designerly, flexible, open, collaborative approach to learning design allowed for effective adaptation to changing circumstances. This was more effective through being formulated as an ethical approach to Design Thinking, shared by teachers, students, the host department, and collaborators (including two VR companies, a physical theatre company, and a design researcher from South Africa). By developing a humanitarian, ethical, and philosophically grounded Design Thinking, and using it for founding principles, the teaching team were able to adapt and learn, making the most of what was possible. We explore this method in depth, focussing upon how a reflective appreciation of modes of knowledge, and the use of visualisations helps us to cope with the complexity of what we are doing together, before, during, and after the period of disruption.

Keywords
design thinking, design education, signature pedagogies, design ethics, philosophy of design

Introduction: our aims for this case study
In this case study we will explore how our approach to designing and implementing courses allows us to achieve the goals of our students, our discipline[s], and the communities with whom we work. This is a transformative pedagogy, engaging across a complex institution and beyond.

We teach and research an inclusive, participatory, developmental, responsive, creative and ethically-based Design Thinking (to be defined below). We also use this version of Design Thinking to design and implement our teaching.

Our suite of for-credit interdisciplinary modules is based at the University of Warwick, a research-intensive university in the English Midlands. In this context, our pedagogic practices are often radical and innovative. Amongst Warwick's highly academic traditional disciplines, they stand out as unusual. This does not result from a desire to be different. Our approach is the result of a systematic and creative student-centric design process, with the aim of creating a sustainable basis upon which we can grow Design and Innovation education across the whole institution.

This case study describes teaching and learning in this specific context, with some challenges that are more rooted in our institutional context, and others that are more generally applicable. Some of our solutions to these challenges will transfer easily to other contexts. By describing both our teaching practices and the challenges they address, it should aid the reader in reflecting on their own challenges and adopting/adapting similar solutions where appropriate.

We describe our approach, as it works in normal circumstances. We argue that it allows us to identify and respond quickly and effectively to the changing needs of our students. It allows us to make the most of the opportunities that we (teachers and students) find in the world (and students are continually encouraged to define their own design challenges). We are highly flexible and responsive (to an extent that is seen as risky in our institutional context), but use this flexibility to create sustainable, enduring, positive, transformations in people, communities and the institution. We then consider the challenges, and opportunities, created by the pandemic of 2020-21, and how our approach adapted to circumstances that could have been extremely disruptive.

The task of creating this account of our work is itself an important designerly-reflective aspect of our approach. We continually engage with communities of practice (including the Design Research Society's Design Education SIG), and acknowledge the great contribution made our many friends and collaborators.

Context

Founded in 1965, mainly on a single campus on the edge of Coventry, a post-industrial city in the English West Midlands. Warwick is a member of the Russell Group of research-intensive institutions, ranked between 8 and 10 in national tables, and 61 in the QS global table. However, Warwick does not have a design school, although aspects of design education and research exist in a fragmented pattern across some disciplines (business, engineering, theatre, education).

We recruit students from most disciplines. In 2020-21 this included: Economics; Liberal Arts; Sociology; Law; Theatre Studies; Physics; Global Sustainable Development; Computer Science; Mathematics; Applied Linguistics; Chemistry; Film and Television Studies; Physics; Life Sciences; Business; Philosophy; Engineering; Cultural Policy and Media Studies.

Our students tend to come from academic-oriented disciplines, often looking to add a practical element to their studies. They are academic high achievers, skilled at passing exams and other conventional forms of academic assessment. Their degree programmes are usually highly specialised, with teaching practices honed to fit with the needs and cultures of each academic discipline. We combine academic knowledge and practical skills, with the aim of growing a capability for developing solutions to social, economic, and environmental challenges.

Table 1. Our modules at the University of Warwick

Title	Level	Department	Number of students
Introduction to Design Thinking Theory and Practice	Undergraduate, 2nd years to finalists.	Based in IATL, available to students from any department.	30
Design Thinking for Social Impact	Masters level.	Based in IATL, available to students from any department.	15
Design Thinking for Social Impact (intensive version)	Masters level.	Engineering, for the MSc Humanitarian Engineering.	15
Innovation 101	Undergraduate, 3rd year and Masters level.	Chemistry	50
Designing Change (foundations) – starting in 2022.	Undergraduate 2nd year.	Liberal Arts, available to students from any Arts Faculty department.	30
Designing Change (advanced) – starting in 2023.	Undergraduate finalists.	Liberal Arts, available to students from any Arts Faculty department.	30

We (the module convenors) are:

> Dr Bo Kelestyn: from Ukraine, educated in England; PhD in Digital Innovation and Design Thinking; Innovation Consultant; Senior Fellow of the Higher Education Academy and Fellow of Enterprise Educators UK; Director of Student Experience and Progression for the Chemistry Department;
>
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These biographical details are important. Neither of us has followed a straightforward academic pathway. We are deeply engaged in change projects across the whole University, covering topics including curriculum design and review, wellbeing, and interdisciplinarity. And we are interdisciplinary by default, joining-up the fragments of design education and research across the University, so as to develop capabilities to meet global challenges and emerging student interests.

What we are aiming to achieve within our teaching

The term "design thinking" has a long and diverse history of use across many fields. There are valid criticisms of some of its more recent incarnations (see especially: Tonkinwise, 2011; Kimbell, 2011; Iskander, 2018). O'Toole (2015, p.62) argues that the popularisation of Design Thinking marks an important "designerly turn" in many fields, and this is something to be welcomed, steered in the right direction, and built-upon.

Within our teaching, we introduce, compare and contrast many strands, including:

1. Research into how designers work (and associated research into creative practice). Richard Buchanan's "Wicked Problems in Design Thinking" (1992) is a good starting point for this, making the claim that designing deploys specially powerful capabilities. The works of Lawson (2007), Cross (2006, 2011) and Dorst (2015) are important here. A research-informed ability to design is an essential foundation for our students.
2. The three dimensions of design identified by Norman (2005) – behavioural, visceral, and emotional. The aesthetic aspect of Design Thinking is included, in response to the claim that Design Thinking has lost this important aspect (Tonkinwise, 2011).
3. Attempts to create new, systematic approaches to designing, including the design patterns approach proposed by Christopher Alexander (1978).
4. The IDEO brand of Design Thinking (Brown, 2009, as a set of tools, techniques, ideas, and attitudes that are packaged to be adopted by businesses and social enterprises. This includes an appreciation of multidisciplinary teams (Kelley, 2005), and IDEO's use of anthropology (Fulton Suri, 2005).
5. Critical responses to Design Thinking and innovation practices (Kimbell, 2011), including critical anthropologies of designing and innovation (Suchman, 2011) , feminist critiques (Prochner and Marchand, 2018; Baker, 2018), and de-colonising design (Tunstall, 2013).

The precise nature and identity of Design Thinking is contested. We explicitly state that the Design Thinking we teach is our own synthesis, our view of what it should be. We take the best from all of these strands, practicing the kind of "generous thinking" that Kathleen Fitzpatrick (2019) argues is essential for the future of universities. There is a critical edge to this, in which we consider some forms of Design Thinking practice as problematic. But this is done positively and with care. Jonathan Chapman has characterised some of these practices as:

> *"…the fast-tracked mode of "design thinking" that has you attend workshops and play designer for the day, where well-meaning gangs of adults giddily exfoliate several bricks of sticky notes in the name of innovation." (Chapman, 2021: 17)*

We are critical of this as a form of "innovation theatre", in which looking and feeling innovative is performed but not substantiated (Blank, 2019). Merely playing the game of innovation may reproduce power structures and inequalities (Iskander, 2018). That would undermine the ethical basis for our teaching and our view of Design Thinking.

The goal of Design Thinking (for us) is to take the methods and concepts used by professional designers, and bring them to communities, so as to enhance, accelerate and sustain the process of innovation (Brown, 2011) for the collective good. This may be characterised as a two way movement or exchange: taking designers out of their studios (their comfort zone) and into the world; bringing the public into the studio and the world of the designer. We add to this the emphasis on virtue-led designing, and practices that reveal, explore, and define the shared virtues towards which we design. In turn, this transforms how designers work and who they are. Design Thinking should grow an independent and locally appropriate design capability amongst the people with whom we work. We aim for our students to become "designerly change agents", going out into the world to develop these capabilities amongst communities.

In 2021 the postgraduate module included a session led by Keneilwe Munyai of the University of Cape Town. With rich examples from her own work with communities across Africa, Munyai explained the difference between designers "designing-for" communities, solving problems for them, and "designing-with" them, developing their own locally-appropriate design capabilities, challenges and solutions (see Munyai, 2019). This was well received by the students, who were deep into the transition from a fast problem-solving mindset (the mindset of already academically successful specialists) to the slower, more inclusive and collaborative, developmental approach required for designerly change agents. Through the Humanitarian Engineering MSc at Warwick, we have seen how this fits with a definition of "humanitarian" guiding a new approach to design and innovation:

> *"Humanitarian principles…include respect for culture and customs; build on local capacities, participation, do no harm, build resilience (or 'build back better'), accountability and dignity." (Newby, 2021)*

This is a version of Design Thinking aligned with Natasha Iskander's proposed anti-Design Thinking approach:

> *"Residents in the area continue to engage in the design process, not as providers of feedback to designers but as lay designers themselves. They help shape both the physical elements of the solution and the social and economic projects that they support." (Iskander, 2018)*

Our Design Thinking is thus an ethical and humanitarian Design Thinking, and our approach to teaching it strives to fit with that ethos. Next, we will consider our methods, how they are aligned to this ethos, and how they equipped us (and our students) well for adapting to the pandemic.

Methods

We use the same approaches for teaching, designing teaching, design practice, and research. The coherence and consistency of this is important. Key steps include:

1. make explicit the full range of our teaching goals, challenges, practices, and ideas, as a series of interconnected design choices, and the theories upon which we base our choices – this includes being clear about how we view our own roles and goals, and how it fits with the wider context and other actors in our network (especially students);
2. share this widely, as visualisations and narratives, with our extended network, including staff, students, and collaborators beyond the institution (academics, industry partners);
3. critically interrogate the assumptions and informational inputs that shape our choices within the teaching team and with members of our extended network;
4. creatively design and make changes, and review the impacts of those changes in relation to our goals and virtues, and those of our students, taking into account a broad range of qualitative and multisensory inputs;
5. refine and share this approach to learning design and implementation.

We are thus actively engaged in the three forms of design research defined by Christopher Frayling (following Herbert Read):

1. research for design – we are engaged in a continuous kind of action research to design learning better, experimenting with teaching methods, refining what we do based on the evidence we observe, and in building theory so as to guide future designing;
2. research into design – reflectively researching our own design methods, informed by work with colleagues, and scholarly work from the design research community;
3. research through design – learning about the world in which, and for which, we are designing, including the University, the communities it serves, and the "bigger picture" beyond that.

These are the same practices we want to see our students undertaking.

There is, however, a danger that we fail to separate out and focus sufficiently on each type of research. We find that our reflective processes do not neatly follow the pattern of reflection-in-action and later reflection-on-action described by Schön (1987), but are closer to the messier reality identified by Eraut (1995) in his critique of Schön. Our knowledge processes are a pragmatic synthesis of the forms of knowledge described by Peter Goodyear (2021), derived from Ancient Greek philosophy:

- *epistêmê* – abstract, conceptual, generalizations;
- *téchnê* – practical know-how;
- *phronesis* – wisdom underpinned by morality;
- *mètis* – tactical, adaptive, context-sensitive.

This latter form of knowledge-practice, *mètis*, has an important role in designing. In *Educating the Reflective Practitioner* (1987), Schön describes how the architect explores a design challenge and its context by making a series of moves, in a "conversation" with things, so as to tease out and follow lines of possibility. In "Wicked Problems in Design Thinking", Richard Buchanan writes that:

> *"The inventiveness of the designer lies in a natural or cultivated and artful ability to return to those placements and apply them to a new situation, discovering aspects of the situation that affect the final design." (Buchanan, 1992: p.13)*

Buchanan argues that this hard-to-formulate way of acting-thinking gives designers the edge in addressing even the most difficult "wicked problems". In our approach, we balance that with *phronesis*, guiding choices through reflection on ethical consequences, with input from *téchnê*, and forming and applying theories to assist us, that is to say, *epistêmê.*

This translates into a fluid, responsive, continually growing approach to teaching and learning in which we, and our students, are continually evolving, both as we learn and as the context in which we operate changes. The teaching team meets each week to choose activities and resources, although in many instances we change our plan during workshops, in response to the students. Each workshop begins with a "reflective jam" session, in which students ask questions, share examples, and reflect. This is essential for our methods. The jam changes the agenda, for immediate action, and for follow-up work. By embracing learning design as a fluid and under-determined process of emergence, we believe that we are being more honest about how learning and how designing actually works. As Goodyear, Carvalho and Yeoman state:

> *"Student activity at learn-time is also emergent, in that it is influenced but not determined by the epistemic, physical and social situation. Rather, the activity emerges from processes of co-configuration, in which students customise what has been designed and set in place for them: selecting from, adding to, re-interpreting and otherwise modifying what has been proposed." (Goodyear et al., 2021, p.448)*

In our teaching, the design-as-implemented and experienced is "co-configured", while our design-as-intended only acts as a guide, not to be adhered to rigidly.

This even goes as far as a co-configured approach to assessment. The design challenges that we use as a focus for each module change, reflecting current events, the interests of our students, opportunities that arise, and what we learn through continual research process. In 2019-20 work aligned with projects and emerging technologies for immersive experiences. In 2020-21 the pandemic had a significant influence, raising fresh challenges and opportunities. 21-22 will see a focus on the environment and the concept of eco-parks. The module and what we learn from it will change. Our accumulating experience and wisdom will grow. Each year, this expands the range and finesses the precision of our repertoire of design options. This case study is a snapshot of this ongoing story.

This could be overwhelming in its complexity, for us and our students. We might easily fail to grasp, for example, how practical choices (*téchnê*) might conflict with our virtues (*phronesis*). To deal with this possibility, we have evolved an approach to designing and design research that gives us a simple, easy to work with, visualisation. This is especially essential when engaging in design dialogue with others in our network. Making things visual, shareable, and easily modified is a classic Design Thinking move. Doing this in a way that is open to our colleagues and students aligns with our open, collaborative, capability-growing ethos.

When designing (or interrogating our design decisions), we work on multiple levels, moving between observations, inferences, choices, and following through consequences at each of these levels:

- a well understood, usable, ethically-based, set of **virtues** defining good designing – if we see these virtues amongst our students, and in our own work, we are succeeding;
- we are developing a clear, actionable and achievable set of **goals** towards which our form of design education aims;
- to meet these goals, we select/create and adapt a set of teaching and learning **strategies** (equivalent to high-level design patterns);
- to implement those strategies we have a large repertoire of **activities**, some from the design and innovation canon, and some that we have ourselves invented;
- and to enable activities, we select tools, spaces, and features from the physical and digital **platforms** available to us – and with our links across the institution, are developing new facilities (including new physical spaces and technology services).

Note how the four forms of knowledge described by Goodyear work in this. *Téchnê* and *epistêmê* are there, as one would expect in a University. But we have ensured this is underpinned by virtue-led *phronesis*. And all the time this is done in a way that is adaptive to the emerging challenges and opportunities we find: *mètis.*

We visualise this in a framework relating the various levels, so that, for example, we can relate choices of technology to our goals and virtues.

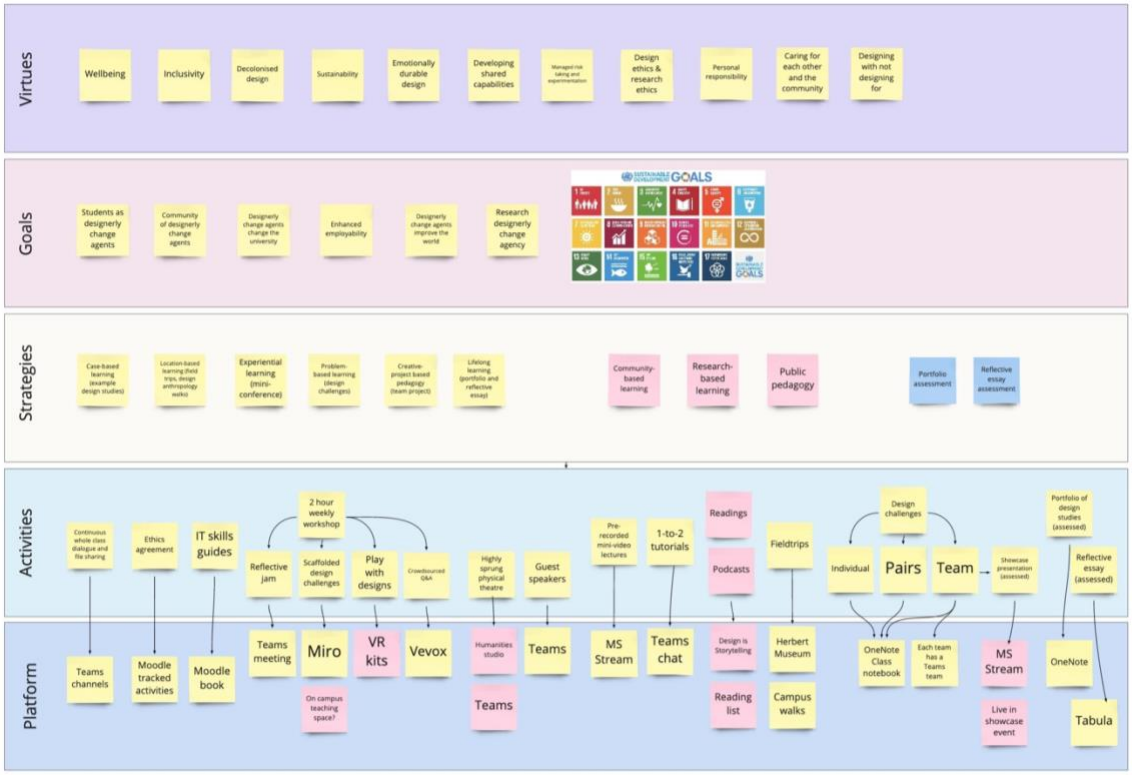

Figure 1: Design for Social Impact module, using the full-stack learning design method.

Pre-pandemic design and implementation

How then do we prompt, guide, support, and assess our students in becoming "designerly change agents", adopting the approach to Design Thinking described above? At the strategy level (middle layer in Image 1), we use a broad range of pedagogic strategies.

Notable features include:

- A emphasis on lifelong-learning, with the students situating Design Thinking in relation to their previous experiences and their future ambitions (this is included in the reflective essay).
- The students complete a series of "design studies" in a portfolio, in response to "design challenges" – the challenges vary greatly, starting with describing a broad range of existing designs, through to proposing new designs for real people in real communities in the UK and abroad. This combines elements of problem-based and case-based learning, with creative projects and location-based learning.
- Our location-based learning includes "design anthropology walks" and a visit to a museum.
- Engaging with the public is an essential aspect of what we do – public pedagogy (where the students learn from engaging with the public) and community-based learning (students learn in communities) are unusual in our academic context, but essential for achieving our goals.

Note how our move towards location-based learning (taking the students out of the University) and public pedagogy (students learning from and with the public) mirrors the movements at the heart of Design Thinking: taking the designer out of the studio and bringing the public into design.

As described above, we fit a lot into our allotted 2 hours a week of face-to-face activities. In most weeks, these start with a "reflective jam" discussion. This breaks-up the conventional hierarchical structure of the university classroom, making learning more open, flexible, and permeable (thus more aligned with our version of Design Thinking). Pre-pandemic, this would occur with the students on chairs in a circle at one end of a long flat floor classroom. We then move to the other half of the room for mini-lectures (15 minutes maximum) and small-group activities. We enrich this with artefacts, encouraging students to bring in interesting objects, as well as using music, stories, and technologies (we have access to VR headsets and media production kit). We do find at first the students are not so keen to contribute. Sharing their design studies with each other in the reflective jam is encouraged, but is not the most popular activity. Students can also be slow to adopt team-working practices. To get over these blockages, we use two very successful activities:

- Highly Sprung Performance physical theatre session – 2 hours of experimenting with physical movement, risk, and reflection, led by facilitators Mark and Sarah Worth, who are experienced at designing performances with the public. Our students tell us that this is an important and transformative experience, setting up the rest of the module perfectly.
- Lo-fi social networking – we create a large wall display of our personal personas, revealing interesting facts and interests, and join them up with a mass of lines to show the density of our connections and similarities amongst the diversity. Students are encouraged to use this approach with the public.

To begin with we focus on building a capability for apprehending, describing, and analysing existing designs. Following the *Mechanisms and Conditions Framework* proposed by Jenny L. Davis (2020), we develop the students' capabilities for understanding their designed worlds, often beginning with mundane everyday features (their own desk, familiar apps, cafes), and growing in complexity and controversy (thinking about the design of software platforms, technology systems such as VR, teaching and learning facilities and activities, and organisations). In other words, turning the ordinary into extraordinary. We want them to see design as both an everyday ubiquitous activity, and an ontologically foundational basis for the power of humanity. See the work of Anne-Marie Willis (2006) on "ontological designing" for a philosophical exploration of these two sides of design.

The aim is for the students to get good at unpicking "how things afford" between the complexities of artefacts and systems, and human intention and experience (as Davis says) – analysing the relationship and gaps between "design-as-implemented" and "design-as-experienced" (O'Toole, 2015), and then theorising and researching the "design-as-intended" – the reasoning, cultural assumptions, cognitive biases, power structures and economic interests that form designs. Davis writes that:

> *"Demarcating the conditions under which technical systems request, demand, encourage, discourage, refuse, and allow not only identifies the politics and values in technical systems but also lays the groundwork for intentional (re) design." (Davis, 2020: p.20)*

In the second half of the module, having built-up confidence, we want the students to see themselves as capable designerly change agents, and to be more ambitious in their aims. The design challenges grow in difficulty, scope and wickedness. They require analysis, synthesis, abductive and creative reasoning, combined flexibly and fluidly (Ball and Christensen, 2019, p.38-39). Special attention is paid to being aware of and avoiding becoming "fixated" on solutions too early, but at the same time not getting over-distracted by possibilities and details – an essential aspect of design capability (Crilly and Firth, 2019). We try to do less direct input, telling the students to treat us more like consultants and coaches than teachers. A different kind of relationship is needed to ease the students through the process of becoming designerly change agents with effective powers of independent judgement.

Four design challenges are set over the length of the module. Each challenge is deliberately broad and vague, requiring the students to develop their own more detailed and more personal brief by interacting with the subject of the challenge and *actually talking with real people* – perhaps quite a novel idea for our institution and therefore sometimes an intimidating experience for our students. The restrictions encountered in 2020-21 pushed this social aspect into the digital space (more on this below). This added an exciting new dimension, allowing us to think more clearly about the contrast between online and physical spaces and interaction. We did have to be mindful of the same ethical considerations of carrying out user insights gathering and often discussed this with the students.

The initial challenges are focussed on looking at aspects of the world and how it is designed now. We begin with the students simply looking at, thinking about, and interrogating, their own study practices. Initially they focus on their own desks and equipment. We encourage them to think about this in multiple ways: behavioural, visceral, emotional (Norman, 2005), social, natural, and philosophical – interrogating the values embedded in the design. Right from the outset, we introduce the role of storytelling. In the second challenge we usually focus on a social space and "design anthropology" (Gunn *et al*., 2013). We usually practice this first, in small groups, walking around campus and the City of Coventry. In 2021 access to social spaces was limited. However, the act of remembering and reconstructing known social spaces imaginatively proved to be a good way to get the students to focus on mood, emotion and detail in relation to each other. Working within constraints reshaped the exercise. Storytelling is also essential to this. We use Ellen Lupton's book *Design Is Storytelling* (2007), which has proved to be popular and effective.

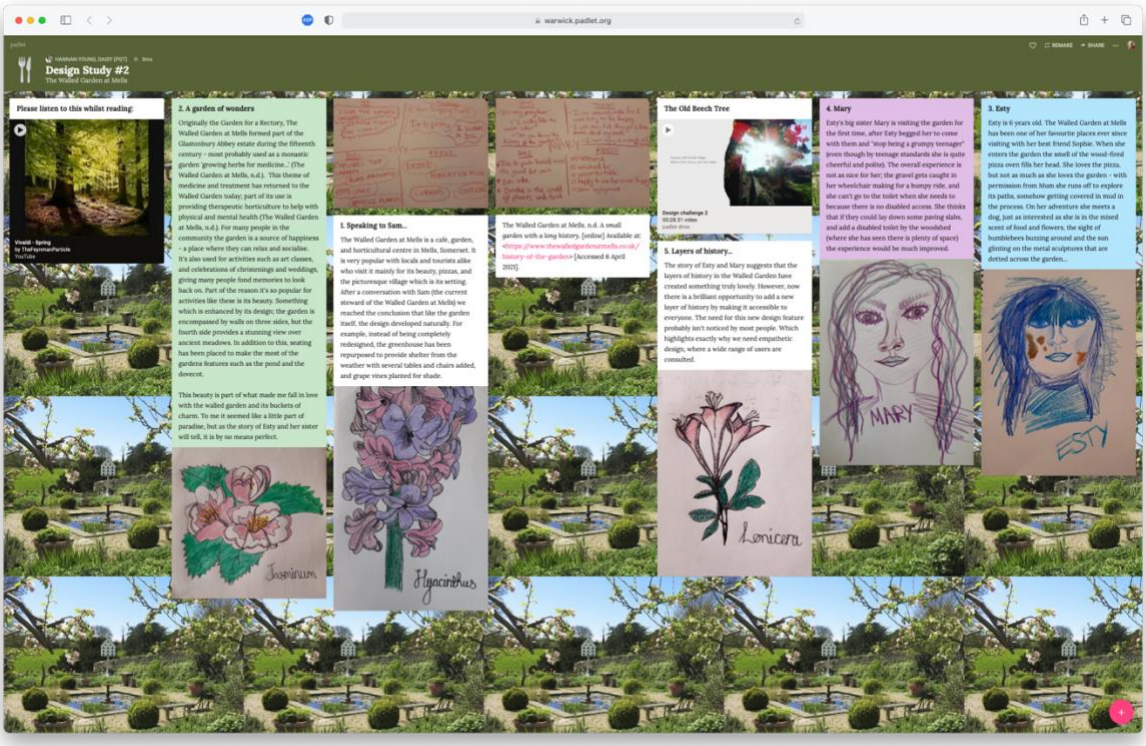

Figure 2. In this study of a café and garden, Centre for Cultural Policy and Media Studies postgraduate student Daisy Hannah-Young used Padlet to create a study with mood and detail inter-related nicely. Students are free to choose a medium that works for their study, and to reflect on their choices (in the reflective essay). This examples includes audio.

In the third challenge the students focussed on apps, now expanding their Design Thinking to consider the trade-off between making an app compelling and making it addictive, with reference to behavioural science (Kahneman, 2013; Thaler and Sunstein, 2008) and a critical perspective on the tech industry's "evil by design" (Nodder, 2013). Under normal circumstances, we then venture out into the wilds, with a study completed in pairs looking at a social space – cafés and museums are especially good for this. We introduce ideas and practices from design anthropology (Gunn, Otto and Smith, 2013). Field trips are used to take the students out of the classroom and for the teachers to model good practice in observing and interacting with people in social places. This has been the one part of our approach that we have not been able to replace with fully online alternatives, although some small experiments with virtual reality and 3D visualisation are showing potential.

Finally, the fourth challenge is a group project, with more of a creative aspect. Again, the brief for this is under-specified. For the undergraduates in 2021 we simply told them to create design ideas for future learning spaces in the University to enable more immersive learning, and to describe activities that could run in them. The under-specified nature of the challenge may be a little painful for the students to begin with, but we anticipate this and prepare them for these initial encounters with the threshold concepts they encounter. They are more used to being asked questions that have a definitive answer. However, we find that by this point in the module, they are used to working in this way, and easily accept the challenge.

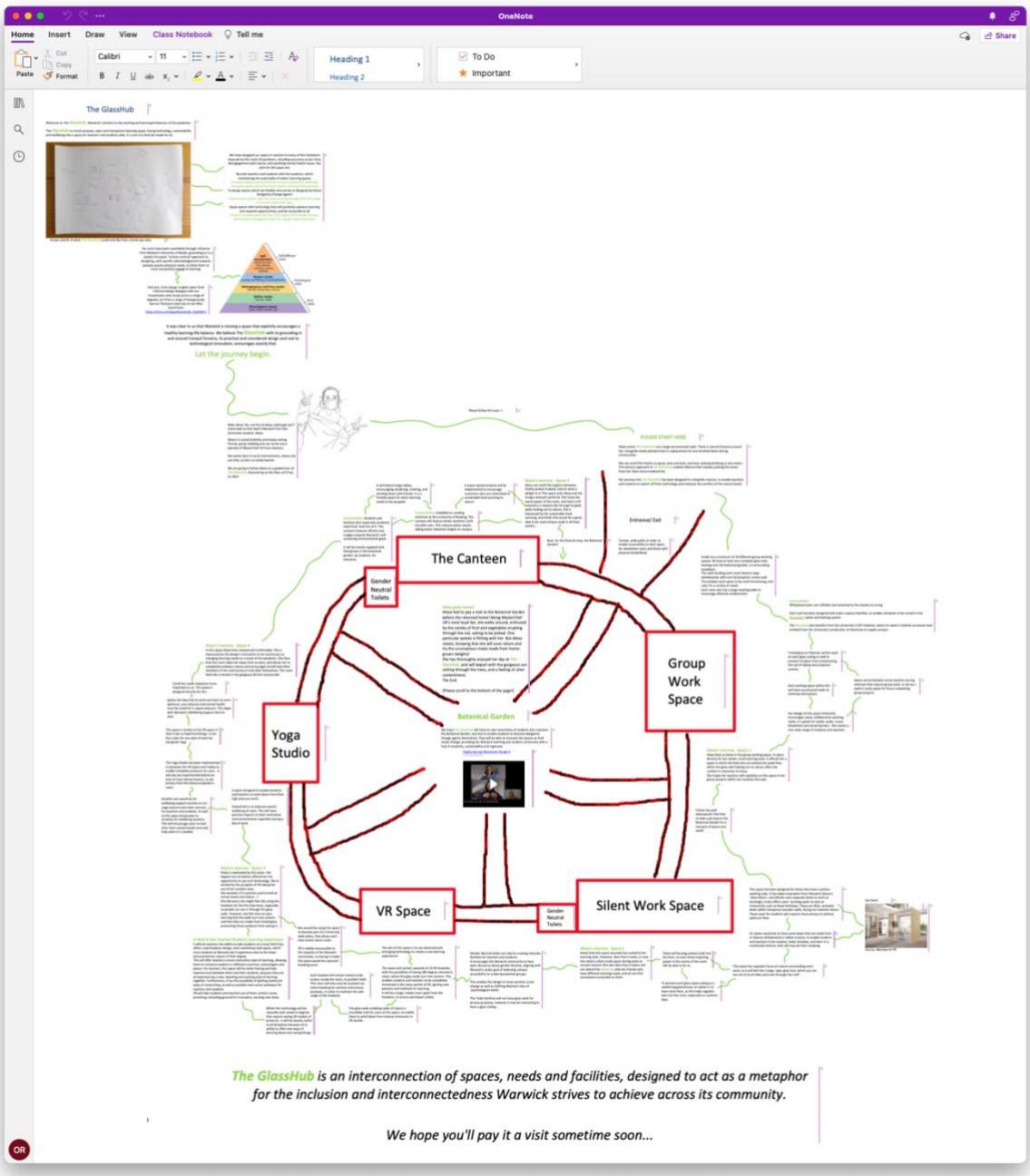

Figure 3. In this study, final year undergraduate student Lucy Chamberlain presents her group's response to the challenge of designing a future learning space for interdisciplinarity. Each student presents their own personal view of the group response. These individual presentations vary greatly.

We also run a mini-conference, open to the rest of the university and the public, incorporating sessions by Warwick alumni. In February 2020 (just in time to be face-to-face) this was led by VR experience and consultancy company Limina Immersive, with input from VR development company Metro Boulet Dodo. The conference focusses on practical, ethical and professional aspects, with the aim of connecting content from the module with real-world examples. Catherine Allen of Limina is a Warwick alumnus. She is in many ways the personification of the designerly change agent, and in the conference tells stories and describes methods that

illustrate Design Thinking in action. To hear this from a Warwick graduate is especially powerful. The openness of the conference allows the students to practice their developing capabilities in public, with feedback from professionals.

To accompany the design studies, each student writes a reflective essay. This is the narrative glue through which they tell their own story of becoming a design thinker, including challenges, dissonances and in-completed threads. They are encouraged to be critical and creative in this. It does not have to be a perfect story – again countering the urge to be *the* experts. The highly personal nature of these essays is essential. In their feedback the students tell us that they value this highly – we show that they matter.

Emergency adaptations?

The pandemic of 2020, a global humanitarian disaster. could have been a disaster for our teaching. We averted that possibility by already having a robust, flexible, responsive design approach, tools, materials and ethos in place (as described above).

By the start of that year we had already adopted a blend of online and on-campus locations for teaching. The forced move online was not a major problem. The team-working platform Microsoft Teams was already an essential tool for us in creating our learning/designing community, and sustaining a continual sense of connectivity with our students. We use all aspects of Teams, especially team channels for group work, document sharing and collaboration, project management, one-to-one chat (for scheduled and impromptu tutorials), and synchronous meetings (including breakout activities). For us, organising our workshops to run online was straightforward. But would we be able to cope with the lack of physical proximity?

Perhaps one of the biggest impacts of the pandemic in 2020 has been in making us be more detailed and analytical when documenting our designs for learning – we cannot rely so easily on the immediacy and flexibility enabled by physical co-presence. With this, comes an greater need for empathy – already essential to Design Thinking. Preparation is more important than ever – not to set teaching in concrete, as that would be contrary to our flexible and responsive approach, but rather to put ourselves in a position to respond more surely and flexibly as needs emerge. The constraints imposed by the digital space on interpersonal communications (O'Toole, 2020) mean that we need to be clearer, signpost what we are doing, especially the different modes of thought and action we choose to engage in. These challenges and adaptations are especially significant in relation to the aspects of our collaborations that Goodyear calls *mètis* – the kind of tricky, explorative, tentative, edging our way through problems and improvising that is essential to our classroom practice. Team teaching that is responsive and flexible depends on this. Could we adapt to the limitations of the online environment?

The answer is: we are getting there. We have had a year and a half of intensive experimentation and learning. We have increased the boldness of our verbal and non-verbal expressions when teaching online, and seen this also happening amongst our students (some more than others). The various platform features have been exploited more effectively (emojis, chat etc.). But perhaps most significantly, we have moved away from just speaking to each other's video streams, to more time collaborating on rich media documents. The Miro

collaborative whiteboard system has made a big contribution. Using Miro we can set up virtual whiteboards with a series of frames containing resources and exercises, and work through them in a structured *and* adaptive way, giving the students coordinated agency and a rich canvas upon which to develop their ideas (see the video demonstration by O'Toole, 2021).

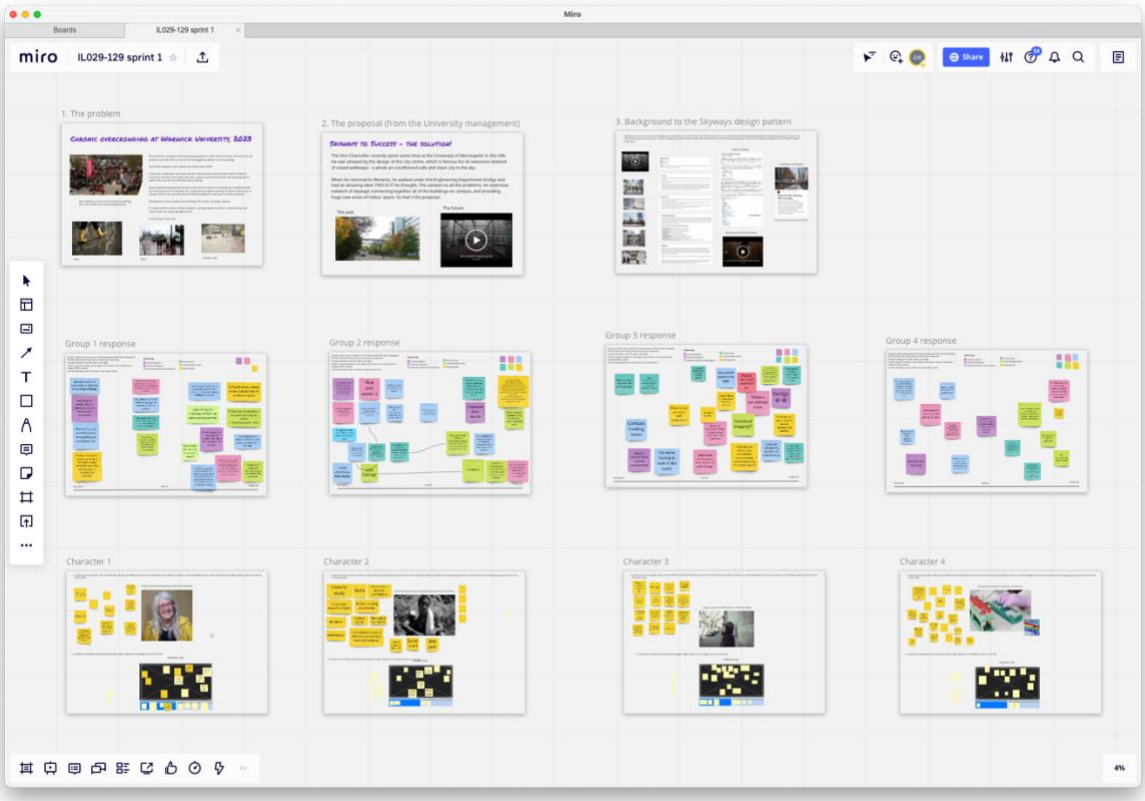

Figure 4. Screenshot showing the structure of a design sprint in Miro. The design challenge and a proposal are given in the first row, with detail including videos and web pages. The students initial response in breakout groups is in the second row. The groups then worked on personas and empathy maps in a second workshop, shown in the third row (how might, for example, Mary Beard respond to the proposed design?).

To some extent the virtual whiteboard also gives a sense of spatial organisation otherwise missing from the videoconference. We are able to set up frames for each group of students and see them working in breakout rooms. As Dave White has argued, the digital is often a "non-place", but pedagogy inherently involves placemaking and the use of spatial forms (White, 2021). We can recreate the physical classroom as a place in digital space using these techniques. Perhaps the most impressive example of this was the way in which Highly Sprung Performance adapted their physical theatre workshop to work online, with each student in their own space interacting physically and intensively over Teams, with great coordination and emotional impact – thus demonstrating how we can design inclusively, with empathy, making the most of constraints and affordances through *mètis* to create sophisticated and effective experiences for learning.

Concluding remarks

Although we have not been able to straightforwardly replicate all of the features of our pre-pandemic design online, our approach to learning design, based on our ethical humanitarian Design Thinking, has allowed us to make the most of the design challenges we have faced. We have not yet fully addressed remaining challenges (location based learning, public pedagogy), however, we have grown our collective design capabilities, learning all the time, sharing that learning, and preparing for further innovation. Our designerly methods have worked well and allowed us to adapt fluidly to the needs of our students and the rapidly changing situation. It is a journey of continuous growth, with as expected fresh challenges and opportunities emerging all the time. In the next year we will build upon what we have learned, refining our approach and investigating new ways to visualise and co-design practice. For example, the Activity-Centred Analysis and Design (ACAD) framework (Goodyear *et al.*, 2021) is a good candidate, as a flexible, easily manipulated, wireframe canvas for designing learning events that are designed to be redesigned in action. We will be experimenting with this in 2021-2022. We also recognise the growing complexity and breadth of the discipline, and how this is challenging for students from non-design disciplines. Mapping this knowledge base and identifying "threshold concepts" (Meyer & Land, 2012) with which students struggle, will also be an important development. There are, as always with designing, many new challenges emerging and new possibilities for enhancing our practice.

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Making the Studio Smaller

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Abstract
The studio is a space apart in the university, an environment unique to creative and design disciplines. As we emerge into the pre-dawn light of the post-COVID era, we should use the insight gained from the pandemic to speculate about the future. This article invites the reader to speculate about the possibility of a smaller design studio in architectural education: one that is smaller in its spatial, temporal, pedagogical and cultural dimensions. What if, instead of demonstrating the plurality of architectural practice through the breadth and diversity of elective studio 'units', we reduce the scope of design courses to create space for others?

Keywords
architecture, architectural education, design studio, pedagogy

Introduction
The studio is a space apart in the university, an environment unique to creative and design disciplines. As we emerge into the pre-dawn light of the post-COVID era, we should use the insight gained from the pandemic to speculate about the future. This article is concerned with the design studio in architectural education, a peculiar inheritance from the nineteenth century École des Beaux-Arts and the pre-university era of office-based apprenticeship. After a century and a half teaching architecture in the studio, the COVID years have given us a glimpse of how design disciplines might be taught without it. For decades, design educators have defended studio learning. Rarely have they engaged pedagogically with the possibility of a smaller studio, not only in its spatial dimensions, but also the temporal, pedagogical and cultural. This paper does not speculate for or against the existence of the studio but asks the reader to imagine what might happen if we make the studio - in all dimensions - smaller.

What Do We Mean When We Talk About Studio?
The article adopts an operative methodology that starts from the middle, immediately outwards from the author's own lived experience of the design studio towards literature and data, before resuming with speculation. This requires a willingness to engage in methods that are neither exclusively empirical nor theoretical. It invokes a so-called "structure of feeling" (Vermeulen & Van Den Akker; Williams & Orrom, 1954) that oscillates between the oppositional poles of modern thought and postmodern feeling, so as to better understand the historical, cultural and affective elements of design education. Much of the author's professional upbringing in architectural education - undergraduate studies from 2001, graduate studies from 2006 and teaching since 2012 - has taken place against the backdrop of a growing awareness of the limitations and faults of the design studio: the site *par excellence* for the perpetuation of a hidden curriculum that prejudices certain individuals and groups, inculcating negative behaviours, attitudes and value systems including but not limited to racism, sexism and ableism (Banham, 1997; Brown, 2012; Datta, 2007; Dutton, 1987; Groat & Ahrentzen, 1996; Salama & El-Attar, 2010; Stevens, 2002; Stratigakos, 2016; Webster, 2008).

The most common response to these critiques has been the redoubling of efforts to improve the design studio: more inclusive, more representative, more democratic etc. (Boyer & Mitgang, 1996). These efforts, while important, are akin to rearranging deck chairs on the Titanic, focusing far more on problem symptoms instead of addressing underlying problem causes. Few propose to replace the studio with something altogether different. Society is facing massive problems like the climate emergency, continued structural racial division, political polarisation, and the consequences of the COVID-19 pandemic. In order to recalibrate design curricula around these challenges, we must do more than just improve what we have been doing. Peggy Deamer argues that we must now work to de-centre the studio (Deamer & Levinson, 2020). There is still no architecture school in the world that has reorganized itself or its curriculum to address pressing global issues such as precarious employment, income inequalities, housing shortages, global warming, and the perpetuation of white supremacism. Individual design studio units that take one or more of these problems as their intellectual agenda *du jour* are not enough.

The Design Studio in Literature

It is apposite to review the literature relating to the design studio in architecture. A literature search was conducted of one of the most highly-ranked and highly-cited English-language journals in this field.[1] The search sought every instance of the word 'studio' in the article titles from 1971 to 2021.[2] Removing duplicates, editorials, prologues, reviews and interviews with practitioners who use the word 'studio' in the name of their practice, the remaining articles were cross-referenced with a Google Scholar citation count to get an impression of the relative influence of these articles. In terms of citations, and therefore influence on the academic discourse of design studio in architectural education, are two texts by Donald Schön: *The architectural studio as an exemplar of education for reflection-in-action* (Schön, 1984) and *Toward a marriage of artistry & applied science in the architectural design studio* (Schön, 1988). They present an attitude "…so often quoted because it supports the status quo, and since that support comes from a distinguished outsider it gives it a special credence" (Till, 2003, p. 167). Both articles are related to Schön's book *The design studio: an exploration of its traditions and potential* (Schön, 1985) and were influenced by the second-hand study of a one-to-one tutorial between a tutor and an architecture student, which became the basis for Schön's argument that design studio education is a demonstration of a kind of mastery-in-action.

A critical reading of design studio pedagogy is presented by the next-most cited single text. Thomas Dutton's 'Design and Studio Pedagogy' (Dutton, 1987) introduces the theoretical framework of the hidden curriculum as a means of analysing the design studio, in which the selection of knowledge and the ways in which social relations are structured to distribute such knowledge are influenced by practices of power in wider society. Dutton's critique highlights

[1] *Journal of Architectural Education (Print ISSN: 1046-4883 Online ISSN: 1531-314X). Published twice annually by the Association of Collegiate School of Architecture (ACSA) in the United States of America since 1947.*

[2] Using the search string: "[Publication Title: studio] AND [in Journal: Journal of Architectural Education] AND [Publication Date: (01/01/1971 TO 31/12/2021)]"

the role of the design studio in the perpetuation of asymmetrical power relations and proposes instead an alternative transformative pedagogy.

In a similar vein, we find an article by Garry Stevens (Stevens, 1995). It previews the arguments laid out in his later book *The Favored Circle* (Stevens, 2002). Stevens delineates the practices of socialization that lie beneath the apparently professional and vocational training in the design studio, highlighting how it favours certain students from certain backgrounds at the expense of others.

Of significant influence amongst these highly-cited papers on the design studio is also Stefani Ledewitz's article 'Models of design in studio teaching' (Ledewitz, 1985). Written at a time when Donald Schön's theories of reflection-in-action were gaining in popularity, Ledewitz proposes a framework for teaching design that clarifies the common misunderstandings of what happens in studio. Citing Schön, she writes:

> *"The lack of clarity over the purpose and effectiveness of the design studio reflects its complexity as a teaching/learning setting. It is characterized by multiple and sometimes contradictory goals, implicit theories, and inherent conditions of 'inexpressibility, vagueness, and ambiguity.' It also reflects the heavy pedagogical responsibility the studio carries in architectural education" (Ledewitz, 1985, p.2).*

Ledewitz refers a characteristic of the design studio that continues to define it today: the "heavy pedagogical responsibility" it carries: the site of synthesis and syncretisation, the meeting in one place of all of the different strands of the discipline.

These five highly influential texts from just one journal capture a snapshot of the most important pedagogical discourses about the design studio in architectural education. Reading across Schön's problematic[3] reading of the design studio, Dutton and Stevens' respective interrogations of its power structures, and Ledewitz's speculation about how we might more lucidly articulate the implicit content of design education, we see that pedagogical interrogations of the design studio have largely focused on demystifying a complex and opaque learning environment. Yet most of these texts are now forty years old. It is not just their age that explains their continued prominence in the academic discourse around architectural education. They are still being cited precisely because they describe matters that remain prescient to educators today.

The model of the design studio in architectural education originates most clearly in the two-hundred-year old École des Beaux-Arts in France, the nearly century-old Bauhaus in Germany, and its contemporary the Vkhutemas in Russia. The spatial, temporal, pedagogical and cultural touchstones of our studio lie in a world that is very different from the one we inhabit today. Why are we so stuck with something that we're so dissatisfied with? In the fallout from the

[3] Helena Webster (Webster, 2008, 69) takes issue that Schön's narrative interpretation of the interaction between teacher and student was, in fact, derived from a second-hand interpretation of another's researcher's transcript (Webster, 2008, 69; after (Schön, 1985, p. 99)). Webster also highlights the epistemological flaws in Schön's argument, namely that he provides no evidence the student has actually learned anything from the apparent demonstration of an individual's mastery in a one-to-one tutorial.

pandemic, we demonstrated our capacity for change. The closure of campuses showed that we are capable of massive structural change. It obliged us not only to change our teaching methodologies, but also to articulate what is so important about our teaching practice. I have proposed elsewhere that the COVID-19 closure of campuses might allow us to better understand the studio through four characteristic dimensions derived from Schön's four learning constructs (Brown, 2020). These four dimensions are:

- the studio as a physical space in the university;
- the studio as a period of time in the calendar;
- the studio as a field of pedagogy;
- the studio as a culture.

If we are to respond to Deamer's call to de-centre the studio, we must do so through all four of these characteristic dimensions.

A Speculation

In the COVID years, we have been forced to imagine a different future, one in which we might never go back to the university campus and the design studio full-time, or in the number, frequency or density we have become accustomed to. In parallel with the pandemic, we have had a glimpse of alternative responses to other major societal problems. Globally, as the climate emergency worsens and popular awareness of the human effect on climate change becomes more informed, the pandemic has given us the chance to consider how it might be possible to work and play with less long-distance travel. In the USA, the breaking point of institutional violence against African American people has made popular the rallying call to defund policing and reallocate resources to education, housing, welfare, and healthcare instead. None of these fights has yet been won, but for the first time in a generation, the possibility of a different future is at least being speculated.

As we plan to return to the university campus and to the design studio, it seems apposite to speculate that there might be a better balance. As interrogations of late capitalism become stronger, what if we stop thinking about expanding or improving what already exists. If we can go back to the studio in the coming months and years, perhaps with new regulations about the capacity and occupational density of such spaces, it seems appropriate to ask what might happen if we make the studio smaller. What follows are four polemical speculations intended to invite the reader - whether they are a student, teacher, or manager - to consider how they might make their own studio smaller. The provocations are written from the point of view of architectural education but may be interpreted for any discipline.

A Smaller Space

Of all four dimensions suggested in this article, the studio is first and foremost a physical space. But that physical space is not a given: virtual design studios have existed in distance learning programmes for decades, not least in architectural education where teachers have recognised that providing students with a digital space to identify themselves can serve to achieve a sense of concretization (Strojan & Mullins, 2002).

The last three decades have witnessed significant growth in participation in higher education worldwide. In architectural education, the consequences have included larger class sizes, fewer

contact hours, and changed student expectations according to increased financial pressure (McLaughlan & Chatterjee, 2020). The studio is already a site of conflict between the competing interests of educators and university management. Many universities, especially those that have marketized (such as in the UK), have been subject to detailed economic analyses of the costs and benefits of providing students with a dedicated learning environment. While the provision of a desk for every student to occupy throughout their studies was commonplace at the turn of the century, many schools of architecture have moved to a hot-desk model (Cai & Khan, 2010). Students are invited to inhabit the studio for only limited periods of time. For teachers defending the costly requirement of a desk in the design studio for every student, one immediate fear in the aftermath of COVID-19 was that online teaching would prove to university managers that we did not need an expensive physical space.

The closure of campuses also prompted students to interrogate what it is about the physical space of the design studio that they value. In a survey of 798 architecture students taken between May and June 2020, 58% reported lower satisfaction with their learning experience following the move online, 79% said the sense of studio community had been negatively affected and only 7% of students preferred online teaching to in-person (Grover & Wright, 2020). The responses from teachers, however, has been more widespread, but amongst architecture educators there is anecdotal evidence that a return to the physical studio cannot come soon enough (Jandrić et al., 2020). Asking if the design studio could be smaller is anathema to many design educators. Yet many teachers continue to promote Richard Buckminster Fuller's credo that we can "do more with less" and Ludwig Mies van der Rohe's dictum that "less is more": by reducing the components of a whole to the absolute minimum we can achieve some kind of clarity.[4] Rather than interpreting these credos as aesthetic challenges, what if we turn them into pedagogical inspiration? Instead of being imposed upon by bureaucratic imperatives to reduce overheads, what if we seize the opportunity for a smaller physical studio in pursuit of a simpler, cleaner and more efficient space?

Students, teachers and institutions that hot-desk cannot avoid the problem of storage. Students cannot allow their work (or waste) to pile up around them. An awareness of the material volume of architectural production is unavoidable. When making way for someone else or when taking the bus, bicycle or car home, students have to confront the scale of their drawings, models and experiments. Making the studio physically smaller has the potential to provoke an awareness of the mass of material that normative studio pedagogies consume. In 2019, my department (an architecture school with around 250 students and around 40 teachers and staff) produced tens of thousands of kilograms of non-recyclable waste. All of it was sent for incineration, including hundreds of kilos of non-recyclable extruded polystyrene insulation, used to make the formwork for a first-year exercise in plaster casting. In many universities, this habit extends into the sanctioned (or required) use of card-encapsulated foam-board, an equally unrecyclable material. For a discipline that is so implicated in the creation of carbon emissions through the construction and use of buildings, it seems profoundly hypocritical to propagate a design culture founded on the excessive consumption of materials.

This first of four arguments to reduce the size of the studio is not to deny the pedagogical benefits of experimentation through drawing and modelling, especially in beginning design

[4] Even if van der Rohe famous achieved this aesthetic by designing purely decorative I-beams on countless façades.

courses. If the reader were to conceive of their own studio, how might it be re-shaped in such a way as to confront the contradictions between our pedagogical traditions and our ever more pressing environmental obligations? What if, rather than fighting the marketized-university's demands to increase the quantitative capacity of our teaching spaces, the reader imagines a smaller studio not shaped by managerial calculations but by a pedagogical intention to explore design by doing more with less?

Figure 1. Stacks of non-recyclable extruded polystyrene insulation, waiting to be used for a model-making exercise in the author's institution.

A Smaller Amount of Time

The European Credit Transfer System (ECTS) provides a structure for the calculation of academic credit and study time in the European Union (EU) member states. An academic year of full-time study at a higher education institution in the EU carries 60 ECTS credits, which is understood to represent a student workload of 1,500 to 1,800 hours per year, with one credit corresponding to 25-30 hours of study (European Commission, 2015). For want of a better system, the ECTS rule of thumb regarding credits and study hours remains (like the fuel consumption testing of cars) an imperfect but functional mechanism for estimating and comparing the workloads we place on students.

In the United Kingdom, the professional bodies charged with validating architecture degrees require that fifty per cent of credits (and therefore study hours) are delivered through design studio projects. If we assume that an architecture student in the UK studies for 1,800 hours a year, she is expected to spend at least 900 hours studying in the design studio. The studio has a

great potential as syncretic learning space through which other aspects of a curriculum can be synthesized with design, but the consequence of this interpretation of regulatory and professional guidance is not only that a student must spend half their time working on design projects, but also that they must spend half their time working on everything else.

The proportion of time allocated to the act of design in architectural education is, perhaps, a misrepresentation of the realities of professional practice: few architects are lucky enough to spend half of their working hours in the act of designing buildings. And since architects tend to agree that their practice is one of lifelong learning, why do we allocate so many study hours in education to learning to design?[5] It can of course be argued that fifty per cent is not enough credits for teaching design and that other subjects should be taught in the studio instead of the lecture hall to better integrate them (Gelernter, 1988).

Recalling Deamer's appeal to re-centre architectural education around global societal issues, what might the reader's studio look like if the number of hours we expect student to spend working on design studio projects was deliberately reduced? What if, instead of trying to maximise the number of hours spent learning how to design, the reader was to create curriculum in their own courses that orienting students towards a lifetime of continual learning in practice? What if opening up the curriculum allowed students to either study electives or an expanded architectural curriculum developing their expanded professional competencies in areas such as business, economics, sociology and the environment?

Smaller Pedagogies

Advocates for the status quo in the studio celebrate the broad field of pedagogical method that it accommodates. Alvin Boyarsky's vision at the Architectural Association in London in the 1970s and 1980s as a "well-laid table" (Sunwoo, 2013) of different studio options set the model for postmodern architectural education. Within the larger studio sit smaller units in which teachers take responsibility for interpreting common learning outcomes through their own thematic lens. Boyarsky abandoned the horizontal design curriculum to invite teachers employed on annual contracts to propose vertical studios, aligning the school's operation with the logic of late capitalism. This created a pseudo-marketplace of consumer choice, giving students the opportunity to choose a thematic pathway and giving management the right to dismiss any staff that the market decided unappealing. While more critical architecture educators use the framework of the elective design unit to deliver high quality teaching informed by educational theory and political agenda (including collaborative workshops, peer-to-peer learning, blends of asynchronous and synchronous teaching, flipped classrooms, experiential learning or live projects), in many institutions survives the kind of studio where students endure the banking model of education acquired by the tutor when s/he was a student (Freire, 1987). The expert-novice relationship theorised by Donald Schön perseveres, where in the realm of student feedback the personality of the tutors becomes more important than the thematic focus or intellectual rigour of the studio.

By developing the concept of the studio as consumer-driven marketplace, Alvin Boyarsky ushered in an era of immense plurality. As a consequence, it reinforced the master-apprentice

[5] An indication of the prolonged learning curve of an architect is *Building Design* magazine's 'Young Architect of the Year Award', which accepts entrants up to the age of 40.

relationship, leading students to choose tutors as if they were choosing a brand of toothpaste according to marketing or word-of-mouth feedback. A programme of elective studio units, when viewed from above, gives the impression of a diverse school with competing worldviews. At ground level, the experience of an individual student who chooses the "wrong" unit will be no different from a bad apprenticeship a hundred and fifty years ago.

If the reader is located in an institution with Boyarskian units, what might replace it? How might pedagogies that are smaller in number but broader in scope serve your curriculum? How might students seek out and find the expertise most appropriate to any given need? How might we re-imagine the original conception of the École des Beaux-Arts architectural atelier, namely an environment founded by students and not by teachers?

Smaller Cultures, but More of Them

If we imagine a studio that is pedagogically smaller, might it also consequently become culturally smaller? Of the three dimensions considered in this article, this is the most abstract and polemical speculation, but it recognises that the architectural design studio has long been known to be a powerful site of cultural reproduction, one in which the individual cultural capital of students can have a critical bearing on their academic success. Garry Stevens writes how:

> *"One can succeed more easily [in architectural education] if one is already halfway successful. The design studio, by relying so much on the presentation of the self to those who will assess the self, favors those who come to architecture already knowing some of the strategies of the game of culture" (Stevens, 2002).*

What if, instead of trying to correct these prejudices, we dramatically reduce the scope of the architecture design studio's dominant culture? Attempts to address the faults of design studio have tended to focus on increasing its cultural diversity through the appointment and promotion of more women and people of minority ethnic backgrounds, and the inclusion of non-white non-male non-western texts and precedents into curricula. It is not the responsibility of minorities to deconstruct the racism of others (Eddo-Lodge, 2020; Oluo, 2019). Such gestures inevitably place the responsibility of diversifying the culture of studio not on those who have created a monocultural studio in the first place, but on those minorities who are attempting to break into it. It becomes an illegitimate diametric in which minority cultural interests are structurally disadvantaged.

What if the reader conceived of their own design studio in which the predominant design culture is reduced in scope so as to make room for others? How you might the reader imagine their studio in a way that does not place minority and majority cultural characteristics in opposition to one another? How might live projects, fieldwork or even study abroad begin to expose students to cultural otherness?

The Studio in the Marketized University

> *"A question central to the education debate … is whether education is still a public good or whether it contributes to the development of society as opposed to the development of individuals …" (Natale & Doran, 2012, p. 188).*

Against these four dimensions of the design studio, we must pay special consideration to the totalizing effects of the marketization of higher education. This affects students through the transfer of the financial burden of education from the state to the individual: graduates leave university with tens, even hundreds, of thousands of pounds of debt which must be repaid through taxation or other means. This financial burden has the effect of extending the reach of one's working life deep into secondary education, where children and teenagers make decisions about their education in order to secure a pathway to an economically profitable role in the workplace.

The marketization of higher education affects teachers as well, and in architectural education it leads to the peculiar reshaping of the design studio. For staff employed on contracts that require research outputs, the research potential of the design studio has begun to be exploited in pursuit of what British academics now often call "REF-able" research.[6] The research design studio centres on the invocation of analysis rather than design as a method, aiming for not only for speculative designs, but also publication or exhibition of those analyses and designs as a result (Varnelis, 2007). The research studio offers an "imperfect method for integrating architecture's public responsibilities with its intensely private creative processes and products" (Salomon, 2011, p. 33) but "the symbiotic relationship between teaching and research practice often results in student abuse, that is, a practice or custom corrupted by the improper or excessive use and treatment of students." (McClure, 2007, p. 73) McClure continues:

> *"The ugly practice of engaging students to do personal research while disguising it as 'coursework' devalues students' contributions to the professional environment. When students labor for one's individual agenda, they are working for you. Even if one sees them as apprentices, 'one who is learning by practical experience under skilled workers a trade, art, or calling,' they are working for you" (McClure, 2007, p. 75).*

Students and teachers alike are subject to the same mechanisms of economic production. While the research studio can produce critical students, it can also be the site of exploitation in pursuit of academic capital. Academics who are contractually obliged to publish research while also taking on ever-greater teaching loads risk treating the design studio as a means to generate intellectual property, either in the research undertaken by students or the imagery produced as part of their studies.

The consequences of these economic mechanisms go far beyond the student and teacher. Many universities are heavily indebted. Student housing is now an investment vehicle, and just as campuses have stood empty throughout the pandemic, so vacant student apartments are exposing both individual and corporate investors to extreme financial stress. Everyone in the marketized university is subject to the capitalist narrative of limitless growth. While advocates of design studio pedagogy are all too familiar with the need to resist the reduction of teaching resources, to discuss the possibility of a smaller studio is a means to counteract the unsustainable model of perpetual growth in higher education.

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[6] The Research Excellence Framework (REF) is the national mechanism by which the quality of university-produced research is assessed, and by which central research funding is allocated to institutions.

Conclusion

Changing the direction of architectural education is akin to changing the direction of an ocean liner. It is difficult to predict what innovations will shape our profession. It will be ten years before our first-year students can spread their professional wings. Herein lies a fundamental challenge. Architectural education is still adhering to structures that were formed in the eighteenth and nineteenth centuries. Teachers, especially those drawn from practice and denied the pedagogical training opportunities of tenured staff, tend to teach in the same ways that they themselves were taught. Yet we are now facing global crises on an unprecedented scale, in which the construction and operation of buildings produce one third of all carbon emissions. Given the scale of the environmental and societal challenges ahead of us, what if instead of trying to do more with studio, we try to do less? This is not an appeal to weaken or diminish the role of design, but to recognise that becoming masterful at the act of designing buildings is a lifelong endeavour, one that requires an incredible diversity of skills and knowledge. We cannot rely on the Boyarskian marketized model of elective design units to give all our students an equal experience of the breadth of approaches to design.

For students and teachers alike, the closure of campuses brought the design studio into the home. It exposed the absurdities of our pedagogical methods. The material detritus of iterative design courses was moved into the bedroom, kitchen and living room.

We know now that we are capable of a hard reset. In the COVID-19 years, we have demonstrated collectively our ability to adapt quickly and dramatically and to form meaningful and powerful networks that span countries and time zones. There is now a chance to look beyond the questions we have attempted to answer over many years through the design studio. There is a chance to change not only the content of architectural education, but also the method. Such a change would of course require extensive and demanding curricular revisions, such as the reallocation of credits and study hours away from design courses towards other (perhaps completely new) courses. Burning questions are presenting themselves about the future of society; the precarity of employment brought about by globalisation; the inequality of income within and between nations; the chronic shortage of decent, climate-adapted and energy-efficient housing; the acceleration of global warming; and despite all this, the perpetuation of white supremacism in many western nations. Individual design studio units that take one or more of these problems as their intellectual *agenda du jour* are not enough. We need to better prepare our graduates for a future where architects are specialists not only in design, but also in energy, material science, sociology, geography, participatory practices, economics, business management and political activism, to name just a few. These are, incidentally, not courses that we need to invent ourselves: many are available to our students in neighbouring departments or faculties, but they are usually denied to them because of the hegemony of a curriculum that is already packed full.

This short article cannot envision what kind of a multiplicity of architectural educations might emerge in a future in which we not only de-centre but also diminish the scale of the design studio. But it can provoke educators to imagine what might happen in all our institutions if we actively and collectively agreed to make the studio smaller. What would we do with the space that we create? What subjects would we offer our students? What interdisciplinary collaborations could we embed in our programmes? What future pathways to architectural practice might we imagine? The author offers this speculation not as an indictment of design

studio, but as an open invitation for teachers from across the many specialisms of architecture to imagine something different.

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