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Abstract: What constitutes, defines or bounds the 'studio' in architecture education when it is wholly online? The design studio contributes to a very particular spatial construct in proximal teaching, one that has been challenged during the pandemic as educators have adopted distance and online learning and teaching. This paper presents a brief history of the design studio in architectural education and speculates about three dimensions of visibility therein. It contextualises the design studio against the broader higher education experiences of teaching online during the Covid-19 pandemic, in particular so-called 'Zoom anxiety' and 'Zoom fatigue' experienced by teachers and students. The paper explores how the visibility of teacher and student in the studio conspire in the reproduction of inequity and precarity in higher education, while also raising questions about students' agency in disabling their cameras in online teaching.

Keywords: design studio, online learning, pedagogy, architecture

1. Introduction

The Covid-19 pandemic is ongoing, and its consequences on higher education are far from fully understood. Quantitative and qualitative data about teacher and student experiences in the Covid-19 pandemic are still emerging, but not enough time has elapsed for sufficiently detailed longitudinal studies into the perceptions of the changes brought about to higher education by Covid-19. Some students have begun their higher education during the pandemic, not knowing any alternative to online teaching. The pandemic is a pivotal moment in the history of pedagogical development. While distance learning in higher education has existed decades (in institutions such as Open Universities Australia or the Open University in the United Kingdom) the Covid-19 pandemic forced those engaged in proximal learning to confront their preconceptions and re-assess their established value systems. (Jandrić et al, 2020 & 2021) The effects of this new cultural reality and the influences of the change in our daily practices are significant.

What constitutes, defines or bounds the 'studio' in design education when it is wholly online? The design studio contributes to a very particular spatial construct in proximal teaching, one that has been challenged during the pandemic as educators have adopted distance

and online learning and teaching methods (Marshalsey and Sclater, 2018). I have written elsewhere about how the personal negotiation my agency as a teacher about the use of lecture capture cameras in the classroom. (Brown, 2022) But now we face an altogether more complex issue: what agency do teachers and students have in a digital learning environment which equates being in class with being in-camera? What can the notion of visibility in the design studio bring to this problem? This paper considers how the visibility of teacher and student in the studio conspire in the reproduction of inequity and precarity in higher education. It also explores the implications of students' agency of disabling their cameras in online teaching platforms during the Covid-19 pandemic.

2. Architecture in the design studio

Some subjects in higher education are better adapted to online teaching than others. Students of the humanities can engage in lectures, seminars and independent study of written texts with relatively little inconvenience, while students of the natural sciences will struggle to replicate the controlled environment and services of the laboratory in their homes. In artistic and creative subjects, the physical requirements of study in higher education are different, requiring space for production and collaboration. In architecture, a creative discipline shaped by professional accreditation, an entire pedagogical culture is built around the engagement of teachers and students in a common learning and teaching space called the studio. The studio in architectural education is derived from an earlier era of nineteenth century professional apprenticeship, and it passed into architectural education relatively unaltered. (Stevens, 2002) The first European architecture school was the École des Beaux-Arts in Paris. The École did not provide students with space to study, so associations would form to rent ateliers in attics of Parisian apartment buildings and directly employ architects to tutor their members. As architecture moved into the university, so too did institutions begin to provide students with a studio space for study. This can be seen to be a direct inheritance of both a wider design studio tradition, but also the studios of practitioners and student associations at the Parisian École des Beaux-Arts.

The studio is a polyvalent environment that has, therefore, been studied and theorized to some extent. Students work, present and even socialize in the studio. Tutors and invited critics enter the studio to undertake teaching and use wall space for performative critiques of students' work. Donald Schön defined four learning constructs of architecture design studio education in *Educating the Reflective Practitioner* (1987): a physical space or constructed environment for learning and teaching; a mode of teaching and learning; a program of activity; and a culture, created by students and studio teachers working together. Earlier, Schön (1985) described a one-to-one tutorial between a tutor and an architecture student in *The design studio: an exploration of its traditions and potential*. The interaction was theorized by Schön as providing evidence of a kind of mastery-in-action. The tutor took the student's drawing implement and proceeded to draw over her work, explaining how he would use his greater knowledge and skills to solve the design problem she had identified. Helena 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 (Schön, 1985, 99). She also highlights the epistemological flaws in his argument, namely that he provides no evidence the student has learned anything from the apparent demonstration of an individual's mastery in a one-to-one tutorial.

The design studio is what Lee Shulman (2005, 54) has referred to as architecture's signature pedagogy. It defines "the architectural design of educational institutions, which in turn serves to perpetuate these approaches." So precious is the design studio to our institutions that since 2011 the Royal Institute of British Architects (RIBA) and Architects Registration Board have explicitly prescribed that the assessed work of undergraduate and taught postgraduate courses in architecture "should consist of at least 50% design studio projects" (RIBA, 2014, 5). Occupying at least fifty per cent of architecture's curriculum (and significantly more of its culture) the Schön-ian shadow cast over design studio pedagogy is significant. The design studio is a complex and multi-dimensional thing. It is the site of both innovation and uncritical replication. It is home to both critical pedagogies that liberate students and uncritical teaching methods which demand their submission to old fashioned ways. As architecture's signature pedagogy, it is also the defining spatial construct of the subject's Covid-19 transition from proximate to distance education. (Brown, 2020)

3. Visibility in the design studio

This paper emerges in part from the collaborative research culminating in the forthcoming book *Studio Properties*. *Studio Properties* addresses the ways in which the visibility of students and teachers in the design studio informs the pedagogical and social structure of the design studio. The architecture of the studio itself represents an explicit and implicit negotiation of visibility. Studios are typically open-plan, ranging in size from smaller domestic-scale rooms (often in older buildings that have been adapted for the purpose) or in larger purpose-built studios that resembling large commercial offices or industrial spaces. The studio is definitively not a classroom, without a discernible "front" or pedagogical hierarchy. Chairs and desks will be arranged in small clusters or individually. There will be areas for displaying work, experiments, and ideas in progress – walls, vitrines, shelves, temporary boards, and whiteboards – areas for making mess, storage, specialist equipment, and digital projectors with screens. We might also encounter beanbags and sofas and small kitchens. The design studio is, without the traditional axial hierarchy of a classroom or lecture theatre, an environment in which both passive and active visibility is inherent to the pedagogical and social networks that occupy it. Students work at desks that are oriented in different directions. Tutors and teaching assistants will move from desk to desk, providing formative feedback through desk crits or tutorials. There is something inherently panoptic about the design studio, in that at any given moment a student may be observed from any other student or teacher.

Visibility works in three interrelated dimensions: i) visible people and activities; ii) visible processes; iii) visible products. Firstly, the studio makes its inhabitants and their activities

visible: if we enter a studio during normal teaching hours, we will see students drawing, painting, cutting, assembling, making, talking, thinking, idling as well as the objects being produced by these processes. Students can both actively and passively watch their peers and their tutors, mimicking the expert who visits their desk for a tutorial (Ashton and Durling, 2000; Kvan, 2001; Schön, 1985). Secondly, the processes of design itself are visible: the research, the making, the material experimentation, the work in various stages – which can be frequently found on desks or pinned to walls. Vyas and Nijholt (2012) have called the walls and desks of the studio "artful surfaces," identifying their specific functions – students using these spaces to manage projects, or collaborative projects, as spaces to collect useful items visual inspiration. They show us how design is being carried out. Thirdly, the products of learning are visible. Students' paintings, models, digital interfaces, drawings, etc. are all visible to one another. This occurs most commonly in the form of a final critique where work is displayed for the whole group for formal and pedagogical scrutiny. Dannels (2005) emphasizes how such critiques are always anchored in that which is material and visible. These products may be kept and stored in the studio, becoming precedents for future study or indicating tacit signals of what is valued (Cennamo & Brandt, 2012).

It is not only the students themselves that are made visible by the architecture of the design studio. Outside of normal teaching hours, we will see half-made things, works in progress, and all the other detritus of a creative discipline. Studios make learning visible by making the people, activities, processes and objects involved in that learning visible. But the design studio is defined by a mutual visibility – to be visible in the studio is also to see and be seen. The studio is a place that encourages both seeing and being seen, creating a space of mutual pedagogical and social oversight. This oversight is inherent to descriptions of so-called 'studio culture,' the socio-cultural environment that has been variously identified as contributing both positively and negatively to the student's learning experience. Studying the literature and student impressions of the design studio in British architectural education, Vowles *et al* (2012, 46) characterise the studio's contradictory nature: it is 'both a rich and intensive medium of teaching and learning' but 'it is also evident that the studio can foster a competitive, intimidating culture and unresolved issues of detrimental, unprofessional and biased working habits remain.'

Stevens (1995 and 2002) has shown how the design studio is a place of indoctrination, one which favours the 'cultivated' individual who enters the studio already in possession of the characteristics of the teacher. Stevens builds his argument on Pierre Bourdieu's idea of embodied cultural capital, explaining how 'it exists within individuals, as attitudes, tastes, preferences, and behaviors. How we talk, walk, and dress, what we like to read, the sports we like to play, the car we like to drive, the sorts of clothes we wear, the entertainments we prefer.' (Stevens, 1995, 108-109) Not all, but many of the markers of these cultural privileges are visible: the things we wear (clothes, accessories and make-up); the technology we use (phones, laptops, tablets and wearables); the language we use and the materials and consumables we can afford to acquire in pursuit of a creative endeavour. Furthermore, the visi-

bility of the design studio exacerbates racial and gender inequity. is predominantly populated by white males, it becomes a site that exacerbates racial and gender inequity, with female or non-binary students experiencing prejudice or alienation. The famously intensive hothouse atmosphere of the design studio, with its long hours and semi-permanent state of occupation by students inevitably prejudices those with caring responsibilities, those with disabilities and those who are women (Groat and Ahrentzen, 1997; Koch, 2002; Caruso, 2008).

The intermission to proximate learning brought about by the Covid-19 pandemic allowed some of those prejudiced by visible difference in the design studio, whether economic, cultural, physical or gender, to consider what it might be like to study without these limitations. While pre-Covid-19 research into the disabled student experience of online education highlighted some failings (Roberts *et al*, 2011), the sudden shift to online learning prompted some scholars of disability studies to admit that 'some of us really don't want things to go back to normal because they never worked for us in the first place.' (Mullaney, 2021) Joining class online was, for many students, an opportunity to evade the passive visibility of the student, and participate without being prejudiced according to others' impressions of their body, ethnicity, gender, clothing or other personal characteristics.

4. Covid-19 and the camera

What happened to these dimensions of visibility in education when the design studio moved online? The rush to distance learning brought about by the Covid-19 pandemic inevitably led many design educators overlook the broad and deep literature in online design studio pedagogy that had been published over the preceding twenty years. Kvan (2001) provides one of the earliest and most concise explanations of the potential advantages of what was then emerging as the Virtual Design Studio (VDS) over its proximate equivalent. Putting online design studios in their historical and pedagogical context, Broadfoot and Bennett (2003) provide us with a warning that research into such inititiatives is often preoccupied with the technology involved, rather than pedagogy. Bender and Vredevoogd (2006) showed how teaching online could refine and 'streamline' the studio experience, providing more targeted teaching to individuals while allowing teachers to increase class sizes without significantly more workload. The pre-Covid online design studio has also been studied from a student perspective, with Osborne *et al* (2011) and Saghafi *et al* (2012) showing how students reacted to and engaged with blending learning environments.

The contemporary landscape of post-Covid higher education has been changed unimaginably by the availability of sophisticated software platforms like Zoom and Teams, which allow teachers to manage video and audio interactions of large classes. But in the literature in online design education, it is worth highlighting important pre-Covid research, such as Fleischmann (2014), which showed how an earlier generation of relatively simple 'web 2.0' software like Flickr and Skype could be deployed in the studio,

enhancing learning without engaging teachers and students in video conferencing. Nonetheless, the almost invisible ubiquity of video conferencing hardware and software brought a significant new aspect to the online design studio experience. This ubiquity was only apparent once we were dispatched from our workplaces and campuses to connect digitally to one another. Peripheral webcams have been available for home computers for several decades, but it was in the early twenty-first century that consumer laptops began to routinely feature built in cameras that faced the user. The first Apple iPhone was launched in 2007, mainstreaming the convergence of the camera and the Internet-connected device. It was with the fourth generation of the iPhone that a supplementary user-facing camera was added so that users could for the first time use their phone and computers interchangeably for video-enhanced calls and conference calls. Apple paired this hardware with a software platform called FaceTime, as if to emphasize that the technology was enabling a new, heightened and more valuable form of face-to-face communication then possible with a telephone call.

By the start of the Covid-19 pandemic, front-facing cameras were so widespread in mainstream consumer products that it was assumed students would have one available to the by default, either via their smartphone or computer.[1] With the availability of camera-equipped hardware taken for granted, all that remained was to download a piece of free software to join the class: most commonly Zoom, Microsoft Teams or Google Meet. Just as cameras were expected to be available by default, so too the software was designed to assume that the camera would be turned on by default. In Zoom, one of the most commonly deployed platforms, the default is for the camera to turn on when a user joins a new meeting. The user must make an active choice to enter meetings without the camera. The camera can be turned on or off using a one-click control, but the default, and therefore the expectation, is to join a meeting on-camera. Zoom is designed to simulate proximal contact between people, providing a simulation of a face-to-face meeting in which expressions, gestures and eye movement can provide a heightened sense of connection between individuals than, for example, a telephone call. An array of up to 49 video feeds of meeting participants can be seen in a single screen. Microsoft Teams also offers a "together" mode which places participants in the seats of a simulated lecture theatre, as if the user is facing a stepped auditorium, making every meeting or class participant feel as though they are a teacher addressing a class (Basu, 2020).

The assumption of access to hardware and the assumption of software that video will be on by default exposes a problematic consequence of these technologies: should it be the default expectation for students to show their faces during online teaching? (Reed, 2020) Is eye contact between teacher and student an assurance of a meaningful learning experience?

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[1] However this constructed a new and previously unforeseen barrier to entry and participation in education. While in the minority, students who did not possess or could not afford the computer hardware were immediately at a disadvantage.

5. Eye contact

Whereas the design studio provides for many dimensions of visibility, online learning and teaching focuses our mutual visibilities into a relatively narrow channel of digital face-to-face communication. This focus reveals much about our relative comfort and discomfort about seeing and being seen on-camera. To illustrate the power of eye contact between individuals, for two and a half months in 2010, Marina Abramović invited visitors to a retrospective exhibition of her work at New York's Museum of Modern Art to sit and hold eye contact with her. Some visitors sat for a whole day, others for less than a minute. The performance demonstrated the intense psychological effect of unbroken eye contact between individuals. Humans have evolved patterns of brief but regular direct eye contact, which vary from person to person according to physiological indices. Subtle changes in pupillary dilation correlate with the amount of eye contact that people report as being comfortable. Abramović's performance interrogated this – quite literally – exploring the limits of the audience members' comfort with unbroken eye contact. One study of more than 400 participants found that an individual's preferred duration of mutual eye contact varied as a function of their individual ratings of threat, trustworthiness and attractiveness. Threatening faces were associated with lower periods of preferred eye contact, while conversely trustworthy faces were associated with longer periods of preferred mutual gaze. (Binetti et al, 2015) Those who prefer to hold direct eye contact for longer tend to display faster pupil dilation when viewing another person than those who prefer shorter durations. Irrespective of our physiological preference for eye contact duration, deviations from our established patterns of proximal contact and direct eye contact have been found to lead to feelings of discomfort (Binetti et al, 2016), the liminal tolerance of which was explored so dramatically by Abramović's performance piece.

The Covid-19 shift to online learning has had a psychological effect on teachers, students and employees alike. Prolonged eye contact, even digital, can be increase anxiety and stress. Furthermore, the limited ability to perceive non-verbal cues through video communication can lead to a sensation referred to as Zoom fatigue. Students may also have competing obligations in their home environments, such as caring for family members. Zooming from a place of residence, they may have requirements for privacy that a virtual background or mute button cannot provide. (Moses, 2020) In addition to heightening perceptions of fatigue, video meetings can also increase the perception of anxiety. Video meetings make heavier demands on our cognitive capacity. By only perceiving a limited range of non-verbal communication (such as hand and body movements) communication by video becomes harder. Additional anxiety about social appearances, awkward silences and technical difficulties also affects our cognitive ability, placing greater stress on students and expending a lot of energy. Emerging research has found a gendered difference in the perception of mirror anxiety, affecting women worse than men. This anxiety is perceived when the user feels physically trapped amid a gaze of multiple faces, the simultaneous reading of which creates an abnormal cognitive load. (Fauville et al, 2021)

How can so-called 'Zoom fatigue' and 'Zoom anxiety' be addressed or ameliorated? Some have encouraged teachers to consider using asynchronous (pre-recorded) video as a compliment to synchronous (live) video, such as Zoom. (Lowenthal et al, 2020) Others have invoked pre-digital traditions, such folk pedagogies, to support teachers to managing both synchronous and asynchronous online teaching. (Henriksen et al, 2020) But what are the consequences for students in the design studio? This paper now explores just some of the Covid-19 pedagogical transitions in the studio-centric subject of architecture. While limited to one discipline, this paper invites teachers of other design disciplines to consider the specific spatial requirements of their subject.

6. Working from home, or living at work?

In the weeks and months after the start of the imposition of national lockdowns, teachers began to report incidences of students joining classes from a variety of unexpected locations. As well as their kitchen tables and bedrooms, students were joining from inside their cars or on benches in parks or outside businesses that provide free wifi. In the United States of America, where the average tuition fee at a private university in 2018-19 was USD35,830 (Bridgestock, 2021) it became particularly apparent that access to the digital infrastructure necessary for distance learning was neither universal nor equitable. Many students did not have reliable broadband Internet at home so were forced to relocate to car parks or public places where wireless Internet was provided. Others were balancing family or care obligations that made them reluctant to activate their camera or microphone. The variety of visual and aural environments of students' remote learning locations revealed much about the socio-economic differences between students. A student's presence in the classroom was no longer a leveller. The means to afford technology and the means to access digital infrastructure became socio-economic distinguishers.

In architecture, a discipline defined by the well-appointed and spacious design studios that our students can normally occupy on a semi-permanent basis throughout the year, the poor spatial qualities of student housing (and the poor quality of internet connections therein) were immediately apparent. Anecdotal evidence suggests that there has been a sharp experiential divide between those architecture students with a spacious, dedicated environment in which to study and those who do not. Students may be understandably reluctant to let an entire class of peers and teachers into their most intimate domestic spaces. Living arrangements and personal relationships are not normally shared with classmates or teachers. In a small one-room apartment (which, with no little irony, we often refer to as "studio apartments") it can be difficult to arrange the detritus of everyday living in such a way that a webcam cannot see your bed, kitchen counter or wardrobe.

Teachers too, have had to juggle the demands of home life and work. Many more teachers than students have children to look after, and the enhanced social and economic capital of being employed (permanently or precariously) in higher education is no guarantee of being able to teach from a home environment that is free of distraction. Despite remote teaching

and distance learning being tried and tested in some contexts, on the whole teachers have been unprepared for the challenges faced in a sudden transition to online teaching. (Hartshorne et al, 2020; Hodges et al, 2020) Whether cameras should be switched on or not during class has become a point of contention between teachers. For many teachers, it is perceived as disrespectful for a student not to make themselves visible during a class. For others, it's disheartening to talk to a computer screen of blank boxes with names instead of faces. How do we know the difference between a student who is actively listening, forming a potential question, versus one who is scrolling the screen of another device or doing something else altogether in another room? (Reed)

Like their peers in other disciplines, architecture teachers have experimented not only with in-built screensharing functions in Zoom and Teams, but also with collaborative drawing platforms like Miro. These platforms are used to try and replicate the experience of interacting with students across a two-dimensional plane of imagery, one which begins to allow teachers and students to engage in the tripartite visibility of design studio discussed earlier. The digital whiteboard might become a space in which students can witness activities, processes and products of these processes. But regardless of these initiatives to witness the activity and products of online learning and teacher, does online teaching require that student's camera be turned on? Does the teacher require visual evidence of their engagement or comprehension to satisfy their requirements? When drawing digitally over a student's work to explicate a design problem, do we require eye contact with our student to be satisfied that our teaching is having the desired effect? Do the performative aspects of teaching and the social aspects of studio depend on the eye contact between teacher and student?

7. A speculation: Visibility in the studio

The nature of visibility as demonstration of societal integration and compliance is a highly sensitive subject. In March 2021 a spokesperson for the Swiss government announced - while wearing a N95-grade surgical mask - that the country had voted in favour of a right-wing proposal to ban face coverings in public. (BBC News, 2021). For decades, the public debate in the global north about face coverings places an individual's religious observance, usually through the typically the Muslim burqa or niqab, in opposition to their collective responsibility for civic engagement and integration. There is equally a long history of face coverings in political activism, such as the Guy Fawkes masks of the Occupy movement or the use of garments as impromptu protection against tear gas. The *Zoom-ification* of higher education has created a similarly complex problem of demonstrating our engagement and our integration in the wider studio community through visibility and therefore through performativity. The pandemic has also heightened corporate interests in the use of such technology to police student behaviour during examinations. (Feathers & Rose, 2020; Swauger, 2020) The rise of so-called proctoring software, which monitors students' eye movements and body language via the camera to detect possible cheating, presents an ever more insidious use of the camera in the remote classroom. The immense cost of proctoring software

represents a staggering shift in universities' financial priorities, away from physical infrastructure and human capital towards corporate interests and the use of technology as a behavioural rather than enabling tool.

The design studio is an environment in which participation is predicated upon degrees of visibility. Architectural education, perhaps more than any other discipline employing the design studio, makes particular spatial requirements on its teachers and students and sets particular expectations about the institutional provision of these spaces. At the heart of the discipline of architecture - and occupying fifty per cent or more of the curriculum and learning outcomes – the signature pedagogy of the design studio is dominant, and it is here that we can find a sophisticated framework for understanding the role of visibility in the learning environment. We understand the design studio as a space in which visibility and power intersect with one another. As discussed above, the design studio has been extensively critiqued in this regard. Donald Schön's famous account of a tutorial between Petra the student and Quist the teacher suggests that it is by witnessing the mastery of her teacher unpicking her design problem that the student will develop. Webster's critique (*op cit*) of Schön's theorization of stands out. Schön's study suffers not just from lack of methodological invalidity but also a lack of any evidence that the student learned anything from the one-to-one tutorial encounter. Webster writes that "Schön's description of teaching is arguably akin to a teacher-centered model; described by the learning and teaching literature as a 'transmission' model of teaching. In recent years phenomenological and ethnographic type research has provided evidence that transmission teaching is not an effective way to inculcate learning" (Webster, 2008, 69-70).

An alternative is to conceive of the studio as a site of socially constructivist teaching, one which obliges the teacher and student to enter the learning situation as equals and co-creators of a curriculum. (Freire, 1996) To what extent do these equals need to be able to see one another? To require students to turn on their cameras during online teaching makes an unreasonable intrusion into their private domain. But to teach to an array of blank squares challenges even the most progressive of teachers. So far, the neoliberal university has responded poorly to this challenge, employing technology to police rather than empower students. Earnest and well-meaning guidance for pedagogical leaders still tends towards the responsibility of the student to take steps to demonstrate (visually or otherwise) their active engagement in online learning. (Pitts, 2020) Zoom and synchronous video conferencing is not sufficient to create sufficiently engaging or transformative pedagogies. To determine how better to shape our online teaching, we need to look not to the technology that is available, but to the defining characteristics of our disciplines. To better understand the function of visibility in the online design studio, we need to re-visit the nature of visibility in the proximate design studio.

This conference track speculates about the definitions and constitution of the online design studio. This paper suggests that existing pedagogical critiques of the design studio can be reconsidered in the post-Covid landscape of higher education as particular speculations of the

nature of student visibility in the studio. We have seen, during the pandemic, countless examples of the socio-economic inequalities revealed by online learning, including access to computer hardware, internet infrastructure and suitable study space. The studio has rightfully been critiqued for its prejudices and inequalities. However, in recreating it online we have an opportunity to reappraise our assumptions about the nature of visibility in the studio. The legitimate discomfort with which both teachers and students have confronted the obligation (or even requirement) to turn on their camera during online teaching gives us a glimpse of the great importance that the design studio places on accessibility but also on visibility.

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